DOCUMENT RESUME

ED 251 449 SP 025 515

AUTHOR	Clark, Christopher M.; Peterson, Penelope L.
TITLE	Teachers' Thought Processes. Occasional Paper No. 72.
INSTITUTION	Michigan State Univ., East Lansing. Inst. for Research on Teaching.
SPONS AGENCY	National Inst. of Education (ED), Washington, DC.
PUB DATE	May 84
CONTRACT	400-81-0014
NOTE	159p.
AVAILABLE FROM	Institute for Research on Teaching, College of Education, Michigan State University, 252 Erickson Hall, East Lansing, MI 48824, ($13.00).
PUB TYPE	Information Analyses (070)
EDRS PRICE	MF01/PC07 Plus Postage.
DESCRIPTORS	Aptitude Treatment Interaction; Cognitive Processes; *Decision Making; Elementary Secondary Education; *Evaluative Thinking; *Instructional Design; Lesson Plans; *Student Reaction; *Teacher Characteristics; *Teacher Response; Teacher Student Relationship; Teaching Styles

ABSTRACT

This review summarizes and synthesizes the research literature on teachers' thought processes from about 1970 to 1983. The literature is organized under four major headings: teacher planning, teachers' interactive thoughts and decisions, teachers' attributions, and teachers' implicit theories. The paper also includes a theoretical model of the relationships among the four major topics reviewed, as well as their relationships to teacher and student behavior and to the contexts of school and classroom. It is concluded that more than a decade of research on teachers' thinking has taught as much about how to think about teaching as it has about the thought processes of teachers. More integrated research efforts are called for, in which the several aspects of teachers' cognitive activity, typically studied in isolation, are examined in all of their interactive complexity. (Author/DG)

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ED251449

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TEACHERS' THOUGHT PROCESSES

Christopher M. Clark
and
Penelope L. Peterson

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Published by

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, Michigan 48824

May, 1984

Publication of this work is sponsored by the Institute for Research on Teaching, College of Education, Michigan State University. The Institute for Research on Teaching is funded primarily by the Program for Teaching and Instruction of the National Institute of Education, United States Department of Education. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the National Institute of Education. (Contract No. 400-81-0014)

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Abstract

This review summarizes and synthesizes the research literature on teachers' thought processes from its beginnings (in about 1970) to 1983. The literature is organized under four major headings: Teacher Planning, Teachers' Interactive Thoughts and Decisions, Teachers' Attributions, and Teachers' Implicit Theories. The paper also includes a theoretical model of the relationships among the four major topics reviewed, as well as their relationships to teacher and student behavior and to the contexts of school and classroom. The authors conclude that more than a decade of research on teachers' thinking has taught as much about how to think about teaching as it has about the thought processes of teachers. They call for more integrated research efforts in which the several aspects of teachers' cognitive activity, typically studied in isolation, are examined in all of their interactive complexity.

TEACHERS' THOUGHT PROCESSES[1]

Christopher M. Clark and Penelope L. Peterson[2]

The thinking, planning, and decision making of teachers constitute a large part of the psychological context of teaching. It is within this context that curriculum is interpreted and acted upon. Teacher behavior is substantially influenced and even determined by teachers' thought processes. These are the fundamental assumptions behind the literature that has come to be called research on teacher thinking. Practitioners of this branch of educational research seek first to describe fully the mental lives of teachers. Second, they hope to understand and explain how and why the observable activities of teachers' professional lives take on the forms and functions they do. They ask when and why teaching is difficult and how human beings manage the complexity of classroom teaching. The ultimate goal of research on teachers' thought processes is to construct a portrayal of the cognitive psychology of teaching for use by educational theorists, researchers, policy makers, curriculum designers, teacher educators, school administrators, and teachers themselves.

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[1] This paper is a chapter in M. C. Wittrock (Ed.), Handbook of Research on Teaching, third edition. New York: Macmillan, in press.

[2] Christopher M. Clark, who formerly coordinated the IRT's Teacher Planning Project, now co-coordinates the Written Literacy Forum. He is also an MSU associate professor of educational psychology. Penelope L. Peterson is a professor of educational psychology and a researcher at the Wisconsin Center for Education Research, University of Wisconsin-Madison.

Both authors contributed equally to the writing of this paper. Clark was responsible primarily for the sections on teacher planning and teachers' implicit theories. Peterson was responsible primarily for the sections on teachers' interactive thoughts and decisions and teachers' attributions. The authors thank Jean Norman, Wisconsin Center for Education Research, for typing the manuscript.

Clark's work was supported by the IRT, which is funded by the National Institute of Education (Contract No. 400-81-4003). Peterson's work was supported by the Wisconsin Center for Education Research, which is funded in part by a grant from the National Institute of Education (Grant No. NIE-G-81-0009). The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the National Institute of Education.

Our aims here are to offer a framework for organizing research on teachers' thought processes, to summarize and comment upon this diverse body of work, and to make recommendations concerning the future of research on teacher thinking. Earlier reviews of this literature (Clark & Yinger, 1979a; Posner, 1981; Shavelson & Stern, 1981) have been helpful to us in conceptualizing the organization of the field and in identifying the relevant studies. In compiling research reports for this review our main criterion was topical. That is, we searched the educational research literature for reports of research on teaching whose titles and abstracts suggested that a primary focus of the research was some aspect of teacher thinking (e.g., planning, decision making, judgment, implicit theories, expectations, attributions). The research reports included in this review constitute a mixture of published journal articles and less widely available conference papers, technical reports, and doctoral dissertations. It is an indication of the newness of this field that most of the work has been done since 1976.

Beginnings of Research on Teachers' Thought Processes

In his book Life in Classrooms, Jackson (1968) reported the results of one of the first studies aimed at describing and understanding the mental constructs and processes that underlie teacher behavior. The descriptive character of his study was a striking departure from contemporary research on teaching and did not fit easily with the then dominant correlational and experimental research paradigms. In 1968 it was difficult to see how description of life in a few classrooms could contribute much to the quest for teaching effectiveness. But the real power of Jackson's research was not to be found in prescriptions for teaching that might be derived from the work. Rather, Jackson's contribution to research on teaching was conceptual. He portrayed the full complexity of the teacher's task, made conceptual distinctions that fit the teacher's frame of reference (such as that between the preactive and interactive phases of teaching), and called the attention of the educational research community to the importance of describing the thinking and planning of teachers as a means to fuller understanding of classroom processes. In sum, Jackson's argument was as follows:

> A glimpse at this "hidden" side of teaching may increase our understanding of some of the more visible and well-known features of the process. (Jackson, 1966, p. 12)

In Sweden, Dahllof and Lundgren (1970) conducted a series of studies of the structure of the teaching process as an expression of organizational constraints. While this work was primarily concerned with the effects of contextual factors on teaching, it revealed some of the mental categories that teachers use to organize and make sense of their professional experiences. Like Jackson's, the Dahllof and Lundgren contribution was primarily conceptual. Of particular significance in the Dahllof and Lundgren research was the phenomonon of the "steering group," a small subset of a class (ranging in achievement level from the 10th to 25th percentile) that the teacher used as an informal reference group for decisions about pacing a lesson or unit. During whole-class instruction, when the students in the steering group seemed to understand what was being presented, the teacher would move the class on to a new topic. But when the teacher believed that the steering-group students were not understanding or performing up to his/her standards, s/he slowed the pace of instruction for all. The steering group is important as a concept both because of its empirical verifiability and because it shows clearly how teachers' mental constructs can have significant pedagogical consequences.

In June 1974 the National Institute of Education convened a week-long National Conference on Studies in Teaching to create an agenda for future research on teaching. The participants in this planning conference were organized into 10 panels, and each panel produced a plan for research in their area of expertise. The deliberations of Panel 6 on "Teaching as Clinical Information Processing" were of particular importance to the development of research on teacher thinking. Panel 6 was chaired by Lee Shulman and included a diverse group of experts on the psychology of human information processing, the anthropology of education, classroom interaction research, and the practical realities of teaching. Panel 6 produced a report (National Institute of Education, 1975a) that enunciated a rationale for and defined the assumptions and the domain of a proposed program of research on teachers' thought processes. The panelists argued that research on teacher thinking is necessary if educators are to understand that which is uniquely human in the process of teaching:

> It is obvious that what teachers do is directed in no small measure by what they think. Moreover, it will be necessary for any innovations in the context, practices, and technology of teaching to be mediated through the minds and motives of teachers. To the extent that observed or intended teacher behavior is "thoughtless," it makes no use of the human teacher's most unique attributes. In so doing, it becomes mechanical and might well be done by a machine. If, however, teaching is done and, in all likelihood, will continue to be done by human teachers, the question of the relationships between thought and action becomes crucial. (p.1)

Beyond this logical argument for attending to teacher thinking, the Panel 6 report went on to cite research on human information processing, which indicates that a person, when faced with a complex situation, creates a simplified model of that situation and then behaves rationally in relation to that simplified model. Simon claims that,

> Such behavior is not even approximately optimal with respect to the real world. To predict . . . behavior we must understand the way in which this simplified model is constructed, and its construction will certainly be related to (one's) psychological properties as a perceiving, thinking, and learning animal. (Simon, 1957; cited in National Institute of Education, 1975a, p. 2)

To understand, predict, and influence what teachers do, the panelists argued, researchers must study the psychological processes by which teachers perceive and define their professional responsibilities and situations.

The Panel 6 report is explicit about the view of the teacher that guided the panelists in their deliberations and recommendations for research:

> The Panel was oriented toward the teacher as clinician, not only in the sense of someone diagnosing specific forms of learning dysfunction or pathology and prescribing particular remedies, but more broadly as an individual responsible for (a) aggregating and making sense out of an incredible diversity of information sources about individual students and the class collectively; (b) bringing to bear a growing body of empirical and theoretical work constituting the research literature of education; somehow (c) combining all that information with the teacher's own expectations, attitudes, beliefs, purposes . . . and (d) having to respond, make judgments, render decisions, reflect, and regroup to begin again. (National Institute of Education, 1975a, pp. 2-3)

In short, the Panel 6 report presented an image of the teacher as a professional who has more in common with physicians, lawyers, and architects than with technicians who execute skilled performances according to prescriptions or algorithms defined by others. This view of the teacher as professional has had a profound effect on the questions asked, methods of inquiry employed, and the form of the results reported in research on teacher thinking. Moreover, the Panel 6 report influenced new initiatives in research on teaching in a more instrumental way--in 1975 the National Institute of Education issued a request for proposals for an Institute for Research on Teaching that would focus on research on teaching as clinical information processing. An Institute for Research on Teaching was established at Michigan State

University in 1976, and this organization initiated the first large program of research on the thought processes of teachers.

A Model of Teacher Thought and Action

A major goal of research on teacher thought processes is to increase understanding of how and why the process of teaching looks and works as it does. To assist the reader in visualizing how the several parts of the research literature on teacher thought processes relate to one another and how research on teacher thought processes complements the larger body of research on teaching effectiveness, we have developed the model of teacher thought and action presented in Figure 1. We make no claims for the empirical validity of this model, but rather offer it as a heuristic device that may be useful in making sense of the literature and as an "advance organizer" for the topics and information that we will present.

The model depicts two domains, each represented by a large circle, that are importantly involved in the process of teaching: (a) teachers' thought processes and (b) teachers' actions and their observable effects. These two domains differ in at least two important ways.

First, the domains differ in the extent to which the processes involved are observable. Teachers' thought processes occur inside teachers' heads and thus are unobservable. In contrast, teacher behavior, student behavior, and student achievement scores constitute observable phenomena. Thus, the phenomena involved in the teacher-action domain are more easily measured and more easily subjected to empirical research methods than are the phenomena involved in the teacher-thought domain. As will be discussed in the next section on

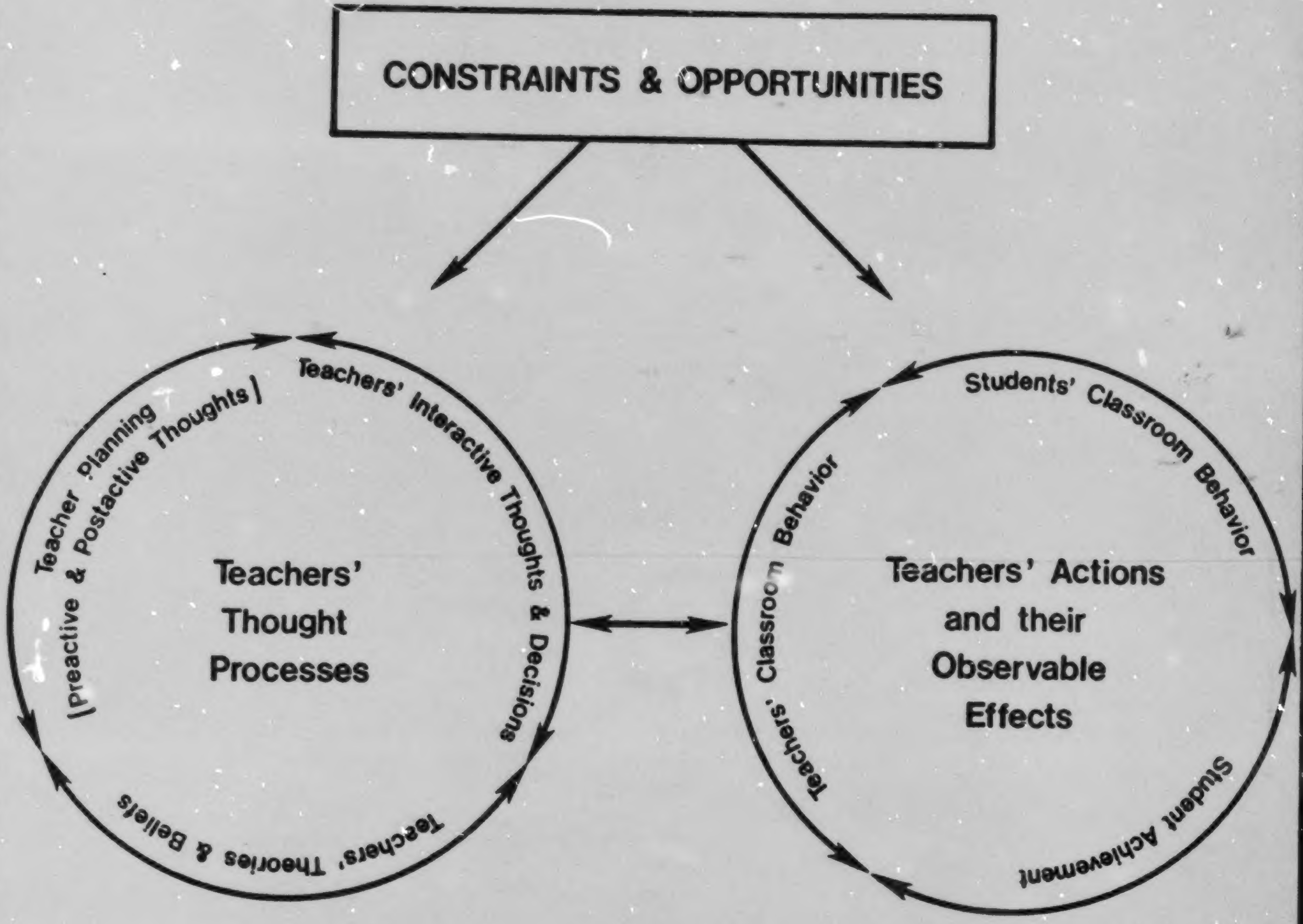
CONSTRAINTS & OPPORTUNITIES
Teacher Planning
(Preactive & Postactive Thoughts)
Teachers' Interactive Thoughts & Decisions
Teachers' Theories & Beliefs
Teachers' Thought Processes
Teachers' Classroom Behavior
Students' Classroom Behavior
Student Achievement
Teachers' Actions and their Observable Effects

Figure 1. A model of teacher thought and action.

methods of inquiry, the domain of teachers' thought processes presents challenging methodological problems for the empirical researcher.

Second, the two domains represent two paradigmatic approaches to research on teaching. Prior to 1975, the dominant research paradigm was the process-product approach to the study of teaching effectiveness. Process-product researchers have been concerned primarily with the relationship between teachers' classroom behavior, students' classroom behavior, and student achievement. In contrast, the domain of research on teachers' thought processes constitutes a paradigmatic approach to research on teaching that has only recently emerged. We will now briefly describe each domain.

Teachers' Actions and Their Observable Effects

The action domain is where classroom teaching actually takes place. Teachers behave in certain ways in the classroom and their behavior has observable effects on students. Process-product researchers have typically assumed that causality is unidirectional, with teachers' classroom behavior affecting students' classroom behavior, which ultimately affects student achievement (see, for example, Dunkin & Biddle, 1974; Doyle, 1978). In the model shown in Figure 1, we assume that the relationships among teacher behavior, student behavior, and student achievement are reciprocal. Moreover, rather than representing the direction of causation as linear, we think it is more accurate to represent the direction of causation as cyclical or circular. Our circular model of teachers' actions and their observable effects thus allows for the possibility that teacher behavior affects student behavior, which in return affects teacher behavior and ultimately student achievement. Alternatively, students' achievement may cause teachers to behave differently toward certain students, which then affects student behavior and subsquently student achievement.

The relationships among the three variables in the domain of teacher actions have been investigated systematically by researchers of teaching effectiveness. This research is summarized and described by Brophy and Good (in press). Unfortunately, however, most researchers of teacher effectiveness have assumed that the relationship between teachers' actions and their observable effects is a linear, unidirectional one and have not explored the possibility of reciprocal effects as we suggest in our model.

Teachers' Thought Processes

Three major categories of teachers' thought processes are encompassed within this domain: (a) teacher planning (preactive and postactive thoughts), (b) teachers' interactive thoughts and decisions, and (c) teachers' theories and beliefs. These categories reflect the researchers' conceptualization of the domain of teachers' thought processes more than an empirically derived categorization of the domain. The first two categories represent a temporal distinction between whether the thought processes occur during classroom interaction (i.e., teachers' interactive thoughts and decisions) or before or after classroom interaction (i.e., preactive and postactive thoughts). These categories follow from Jackson's (1968) distinction between the preactive, interactive, and postactive phases of teaching. These distinctions were first used by Crist, Marx, and Peterson (1974) as a way of categorizing teachers' thought processes because these researchers hypothesized that the kind of thinking teachers do during classroom interaction would be qualitatively different from the kinds of thinking teachers do before and after classroom interaction.

As we will discuss in our review of research on teachers' thought processes, the distinction between teachers' interactive thoughts and decisions and their preactive thoughts and decisions has been retained by researchers and appears to be important. The kind of thinking teachers do during interactive teaching does appear to be qualitatively different from the kind of thinking they do when they are not interacting with students. In contrast, the distinction between teachers' preactive and postactive thoughts does not seem to have been retained by researchers. These two categories have been subsumed under the category of "teacher planning." Teacher planning includes the thought processes teachers engage in prior to classroom interaction but also includes the thought processes or reflections they engage in after classroom interaction that then guide their thinking and projections for future classroom interaction. For example, teacher planning includes the reflections the teacher has at the end of a given day that then cause the teacher to plan a certain activity for the class the next morning. Thus, because the teaching process is a cyclical one the distinction between preactive and postactive thoughts has become blurred.

The third category, teachers' theories and beliefs, represents the rich store of knowledge teachers have that affects their planning and their interactive thoughts and decisions. The arrows in the model indicate these effects. Of course, teachers may also develop theories and beliefs as a result of their thinking during classroom interaction and their planning prior to and following classroom interaction. Thus, as the arrows in the model indicate, teachers' interactive thoughts and decisions and teacher planning, respectively, may also affect teachers' thoughts and beliefs.

We have included these three categories of teachers' thought processes--teacher planning, teachers' interactive thoughts and decisions, and teachers' theories and beliefs--because to date the research on teachers' thought processes has been directed toward these three major topics. In our model and in our subsequent review of the research on teachers' thought processes, we have chosen not to separate out a fourth category, teacher judgment, which has been treated as a distinct category by earlier reviewers of this research. (See, for example, Clark & Yinger, 1979a; Shavelson & Stern, 1981). We decided not to discuss research on teacher judgment as a separate category because teacher judgment is but one cognitive process that teachers use in their planning and interactive decision making. Thus, we have subsumed the research on teacher judgment under the appropriate category of teacher planning, teachers' interactive thoughts and decisions, or teachers' theories and beliefs.

In sum, the three categories in the domain of teachers' thought processes reflect the state of the field in research on teachers' thought processes and thus reflect the researchers' conceptualizations of the field. For this reason, we have chosen to use these three categories as the organizing topics for our review of the research literature.

Constraints and Opportunities

A complete understanding of the process of teaching is not possible without an understanding of the constraints and opportunities that impinge upon the teaching process. Teachers' actions are often constrained by the physical setting or by external influences such as the school, the principal, the community, or the curriculum. Conversely, teachers may be able to behave in a certain way simply because they are given a rare opportunity to do so. Teachers' thought processes may be similarly constrained. For example, teachers may have, or perceive that they have, less flexibility in their planning because certain curriculum decisions have been made already by the school district or the principal. Alternatively, other principals may give teachers more flexibility and opportunity to engage in planning and decision making. Indeed, the extent to which responsibility and participation in the decision-making process are given to teachers (here defined as constraints and opportunities) has been shown to be an important variable that defines effective schools. (See, for example, Good & Brophy, in press). Therefore, we deem this variable an important one that needs to be included in any model of the process of teaching. Moreover, as we shall discuss in our review of the research on teachers' thought processes, research findings suggest that teachers' thought processes are affected profoundly by the task demands and the teachers' perceptions of the task. We view task demands as encompassed within constraints and opportunities.

The Relationship Between the Domains of Teacher Thought and Action

As the double-headed arrow between the domains of teacher thought and action in our model indicates, there is a reciprocal relationship between these two domains. Teachers' actions are in a large part caused by teachers' thought processes, which in turn affect teachers' actions.

However, we contend that the process of teaching will be fully understood only when these two domains are brought together and examined in relation to one another. We hope the model presented in Figure 1 will serve as a useful step toward achieving such a synoptic view of the process of teaching and will also aid the reader in understanding the topics and issues we address in the remainder of this chapter.

In the remainder of this paper, we will review and discuss the research that has been done on teacher planning, teachers' interactive thoughts and decisions, and teachers' theories and beliefs. Before beginning our review, however, we provide a brief overview of the several methods of inquiry that have been used in research on teachers' thought processes.

Methods of Inquiry

The systematic study of teachers' thought processes demands that researchers deal with serious technical, methodological, and epistemological challenges. This research depends heavily on various forms of self report by teachers, and the central methodological problem is how to elicit and interpret valid and reliable self reports about cognitive processes. The use of verbal reports as data has been criticized by Nisbett and Wilson (1977), and their arguments have been challenged by Ericcson and Simon (1980). Ericcson and Simon indicated that verbal reports will be most reliable and valid as data when a person is reporting on the contents of short term memory, that is, that which s/he is currently attending to. Less reliable and valid data will result from probes that are vague and general or that require respondents to use inferential processes to complete or elaborate partially remembered information.

In the studies reviewed here, the researchers usually employed various combinations of five methods of inquiry: thinking aloud, stimulated recall, policy capturing, journal keeping, and the repertory grid technique. Often these methods were supplemented by interviews, field observations, and narrative descriptions of the task, the context, and the visible behavior of the participants in a study. We will briefly describe each of these methods. (Shavelson, Webb, & Burstein, in press, discuss these methods further.)

Thinking Aloud

The thinking aloud method consists of having a teacher verbalize all of his/her thoughts while engaged in a task such as planning a lesson (e.g., Peterson, Marx, & Clark, 1978) or making judgments about curriculum materials (e.g., Yinger & Clark, 1982). The teacher's verbalizations are recorded, usually on audiotape but occasionally on videotape (e.g., Smith & Sendelbach, 1979), and later transcribed to create typewritten protocols. The protocols are then subjected to various kinds of coding systems (almost always created by the investigator) to produce descriptions of the content of teacher thinking and the sequences of cognitive processes that teachers follow while planning, making decisions, and teaching.

Stimulated Recall

The stimulated recall method was used originally by Bloom (1954) and consists of replaying a videotape or audiotape of a teaching episode to enable the viewer (usually the teacher of the episode) to recollect and report on his/her thoughts and decisions during the teaching episode. Variations in the use of stimulated recall include replaying only researcher-selected portions of the recording versus replaying the complete tape with researchers asking prespecified questions each time the tape is stopped versus soliciting open-ended commentary from the teacher while the researcher controls when to stop the tape versus the teacher controlling when to stop the tape or the teacher sharing control with the researcher. The teacher's reports and comments about thoughts and decisions while teaching are audiotaped, transcribed, and subjected to content analysis. Conners (1978a) and Tuckwell (1980a; 1980b) provide a summary, an analysis, and recommendations regarding techniques for conducting stimulated recall sessions and analyses of the resulting protocols. Calderhead (1981) offers a more theoretical and philosophical analysis of the limits and possibilities of stimulated recall in the study of teaching.

Policy Capturing

Policy capturing is a method borrowed from laboratory psychology (e.g., Hammond, 1971; Rappoport & Summers, 1973) for use in studying teacher judgment processes. In a typical policy-capturing study, a teacher is presented with a series of printed descriptions of students, hypothetical teaching situations, or curricular materials. These descriptions have been edited by the researchers so that all possible combinations of as many as five features or "cues" appear in the full set of objects to be judged. The teacher is asked to make one or more judgments or decisions about each printed description, usually recorded on a Likert scale. The goal of this approach is to produce mathematical models (usually linear regression equations) that describe the relative weightings that teachers attach to the features of the objects being judged as they make judgments about them. The resulting equations represent the "policy" of the teacher in relation to the domain in which the judgments were made (e.g., assignment of students to reading groups, selection of curricular materials). Of the several methods used to study teacher thinking, policy capturing depends least on teacher self-reports. However, the method is limited to relatively simple judgment situations that involve a small number of cues or features (typically five or fewer) that can be identified a priori by the researchers. (See Yinger and Clark (1982) for a comparison of the strengths and limitations of policy-capturing and think-aloud methods in research on teaching.)

Journal Keeping

The primary application of journal keeping in research on teacher thinking has been in the study of planning. Teachers are typically asked to keep a written record of their plans for instruction as they develop and to comment in writing on the context in which their plans are made, their reasons for selecting one course of action over another, and their reflections on and evaluation of their plans after they are brought into action in the classroom. Journal keeping is usually supplemented by frequent interviews, both to encourage and support the teacher in the often demanding and unfamiliar process of journal keeping and to clarify and elaborate unclear or incomplete journal entries. In some cases, the researcher enters into a written dialogue with the teacher in the pages of the journal. Journal entries are subjected to content analyses and the data are used to generate descriptions and models of the planning process and the factors that influence it. (For a discussion of the use of dialogue journals see Staton (1982).) Yinger and Clark (1981) discuss theoretical and practical issues in the use of journal writing in research on teaching.

The Repertory Grid Technique

The repertory grid technique has been used in the study of teachers' implicit theories. This technique was developed by Kelly (1955) as a method for discovering the personal constructs that influence individual behavior. An individual is presented with a series of cards on which are written single words or statements about the domain of interest to the investigator. The subject is asked to indicate which cards are alike or different and to explain why. The resulting groupings and their associated rationales are labeled as "constructs" by the investigator. The constructs and their component elements are then arrayed in a grid format to show (either by inspection or through factor analysis) the relationships among constructs. Variations in the repertory grid technique include having the respondent generate the elements to be sorted (e.g., Munby, 1983) and involving the respondent in analysis of the relationships among components through clinical interviews (e.g., Olson, 1981).

Teacher Planning

Researchers have conceptualized teacher planning in two ways. First, they have thought of planning as a set of basic psychological processes in which a person visualizes the future, inventories means and ends, and constructs a framework to guide his/her future action. This conception of planning draws heavily on the theories and methods of cognitive psychology. Second, researchers have defined planning as "the things that teachers do when they say that they are planning." This definition suggests a phenomonological or descriptive approach to research on teacher planning in which the teacher takes on an important role as informant or even as research collaborator.

Both of these views of teacher planning are represented in the research literature either explicitly or implicitly. These two different starting points for the study of teacher planning probably account for the variety of methods of inquiry in use and for the challenge that reviewers of this literature face in pulling together a coherent summary of what has been learned. Planning is challenging to study because it is both a psychological process and a practical activity.

We have organized our review of the research on teacher planning to address three major questions: (a) What are the types and functions of teacher planning? (b) What models have been used to describe the process of planning? and (c) What is the relationship between teacher planning and the teacher's subsequent actions in the classroom?

Types and Functions of Teacher Planning

What are the different kinds of planning that teachers do, and what purposes do they serve? The answer to both parts of this question seems to be "many." That is, many different kinds of planning are in use, and they serve many functions.

Types of planning. Table 1 summarizes the findings of eight studies in which researchers investigated the types and functions of teacher planning. Yinger (1977) and Clark and Yinger (1979b) determined that during the course of a school year, experienced teachers engaged in

Table 1

Summary of Findings of Eight Studies of the Types and Functions of Teacher Planning

Study	Method of Inquiry	Teachers	Subject Matter	Principal Findings
Clark & Elmore (1979)	Observation, interview, & journal keeping.	5 teachers of grades K-5.	All	1. Planning early in school year focuses on establishing the physical environment and social system of the classroom.
Clark & Elmore (1981)	Think aloud during yearly planning.	1 teacher of grade two.	Mathematics, Science, Writing	1. Functions of yearly planning: a) to adapt curriculum to fit teacher's knowledge and priorities, and unique classroom situation; b) for teacher to learn the structure and content of new curricula; c) to develop a practical schedule for instruction.
Clark & Yinger (1979b)	Written description of plans by teachers.	78 elementary teachers.	All	1. Eight types of planning: weekly, daily, unit, long range, lesson, short range, yearly, term. 2. Three most important types: unit, weekly, daily. 3. Planning functions to a) meet immediate psychological needs of the planner, b) prepare the teacher cognitively and instrumentally for instruction, and c) guide the interactive processes of instruction.
McCutcheon (1980)	Ethnography.	12 teachers of grades 1-6.	All	1. Much teacher planning is never put on paper. 2. Functions of written lesson plans: a) to meet adminstrators' demands, and b) for substitute teachers. 3. Long range planning viewed as counter productive because of unpredictable changes in schedule and interruptions.
Morine-Dershimer (1977)	Observation, analaysis of written plans & interview.	20 teachers of grade 2; 20 teachers of grade 5.	Reading, Mathematics	1. Most lesson planning done mentally rather than on paper. 2. Outline or list of topics most typical form of plan.
Morine-Dershimer (1979)	Interview, observation & stimulated-recall.	10 elementary teachers.		1. Mental "image" of a lesson plan used to guide teacher behavior during routine instruction. 2. Lesson plan largely abandoned when activity flow is threatened with disruption.

Table 1 (continued)

Summary of Findings of Eight Studies of the Types and Functions of Teacher Planning

Study	Method of Inquiry	Teachers	Subject Matter	Principal Findings
Smith & Sendelbach (1979)	Observation, think aloud, & stimulated-recall.	4 teachers of grade six.	Science	1. Teachers depend heavily on published teacher's guides. 2. Planning produces a mental image of the unit to be taught. 3. While teaching, the teacher tries to recall and enact this mental image of the plan (with very little of the plan on paper).
Yinger (1977)	Ethnography, observation, & interview.	1 teacher of combined grades 1 & 2.	All	1. Five types of planning: yearly, term, unit, weekly, and daily. 2. The "activity" was the basic unit and starting point for planning. 3. Routines are used to simplify complexity for both teacher and students.

as many as eight different types of planning. The names of six of these eight types designate a span of time for which the planning took place: weekly, daily, long range, short range, yearly, and term planning. The remaining two types (unit and lesson planning) describe a unit of content for which the teachers planned. Judging from these empirically derived typologies of teacher planning, we would conclude that substantial teacher energy is devoted to structuring, organizing for, and managing limited classroom instructional time.

Yinger's (1979) finding that routines are a principal product of teacher planning (also supported by the work of Creemers & Westerhof, 1982; & Bromme, 1982) suggests that teachers respond to the press for simplification and efficient time management by planning. Yinger defined routines as sets of established procedures for both teacher and students that function to control and coordinate specific sequences of behavior. He identified four types of routines as products of teacher planning: (a) activity routines, (b) instructional routines, (c) management routines, and (d) executive planning routines. Routines ". . . played such a major role in the teacher's planning behavior that her planning could be characterized as decision making about the selection, organization, and sequencing of routines" (Yinger, 1979, p. 165).

The relative importance of different types of planning was also explored by Clark and Yinger (1979b). Unit planning was cited most often by the teachers as most important, followed by weekly and daily planning. Only 7% of the teachers in this study listed lesson planning among the three most important types.

Researchers have also investigated the dynamic relationships among different types of planning. Morine-Dershimer (1977; 1979) found that teachers' written plans seldom reflect the teachers' entire plan. Rather, the few details recorded on a written plan were nested within more comprehensive planning structures, called "lesson images" by Morine-Dershimer. These lesson images, in turn, were nested within a still larger construct called the "activity flow" by Joyce (1978-79). For elementary teachers, the activity flow encompasses the year-long progress of a class through each particular subject matter. It is concerned with the balance of activities across subject matters in a school day or week.

Further support for the idea that teacher planning is a nested process comes from a study by Clark and Elmore (1979). Clark and Elmore interviewed and observed five elementary teachers during the first five weeks of the school year and found that teachers' planning was concerned primarily with setting up the physical environment of the classroom, assessing student abilities, and establishing the social system of the classroom. By the end of the fourth week of school, the teachers had established a system of schedules, routines, and groupings for instruction. These structural and social features of the classroom then persisted throughout the school year and served as the framework within which teachers planned particular activities and units. Other studies of the first weeks of school also support the conclusion that, to a significant degree, the "problem space" (Newell & Simon, 1972) within which teacher and students operate is defined early, changes little during the course of the school year, and exerts a powerful, if subtle, influence on thought and behavior (e.g., Anderson & Evertson, 1978; Buckley & Cooper, 1978; Shultz & Florio, 1979; Tikunoff & Ward, 1978).

Functions of planning. Findings from research on teacher planning suggest that teachers have as many reasons to plan as they have types of planning. Clark and Yinger (1979b) found that teachers' written responses to a question about why they plan fell into three clusters: (a) planning to meet immediate personal needs (e.g., to reduce uncertainty and anxiety, to find a sense of direction, confidence, and security); (b) planning as a means to the end of instruction (e.g., to learn the material, to collect and organize materials, to organize time and activity flow); and (c) planning to serve a direct function during instruction (e.g., to organize students, to get an activity started, as a memory aid, to provide a framework for instruction and evaluation).

In an ethnographic study of the planning of 12 elementary teachers, McCutcheon (1980) confirmed that some teachers plan to meet the administrative requirement that they turn in their plans to the school principal on a regular basis. These teachers also indicated that special plans were necessary for use by substitute teachers in the event the regular teacher was absent. These plans for substitute teachers were special both because they included a great deal of background information about how "the system" in a particular classroom and school operated and because the regular teachers tended to reserve the teaching of what they judged to be important material for themselves, and they planned filler or drill and practice activities for the substitute teachers.

Planning and the content of instruction. The most obvious function of teacher planning in American schools is to transform and modify curriculum to fit the unique circumstances of each teaching situation. In one of the only studies of yearly planning, Clark and Elmore (1981) asked a second-grade teacher to think aloud while doing her yearly planning for mathematics, science, and writing. The teacher reported that the primary resources she used in her yearly planning were curriculum materials (especially the teacher's guides), her memory of classroom interaction during the previous year, and the calendar for the coming school year. Her process of yearly planning, typically done during the summer months, consisted of reviewing the curriculum materials she would be using during the coming year, rearranging the sequence of topics within curricula, and adding and deleting content to be taught. A broad outline of the content to be taught and, to a lesser extent, of how it would be taught, emerged as she mentally reviewed the events of the past year and adjusted the planned sequence and pace of teaching to accommodate new curriculum materials and new ideas consistent with her implicit theory of instruction. Through her review of the past year, reflection on her satisfaction with how things went, and modifications of the content, sequence, and planned pace of instruction, the teacher's yearly planning process served to integrate her own experiences with the published materials, establishing a sense of ownership and control of content to be taught (Ben-Peretz, 1975). Yearly planning sessions satisfied her that she had available the resources to provide conditions for learning that would be at least equal to those she had provided during the previous year. For this teacher, yearly planning decreased the unpredictability and uncertainty that attend every teaching situation.

The Clark and Elmore study (1981) of yearly planning supports the idea that published curriculum materials have a powerful influence on the content and process of teaching. In a study of teacher planning for sixth-grade science instruction, Smith and Sendelbach (1979) pursued this idea at the level of unit planning. Working with the SCIS (Science Curriculum Improvement Study) science curriculum, Smith and Sendelbach compared explicit directions for a unit of instruction provided in the teacher's manual with four teachers' transformations of those directions into plans, and, finally, with the actual classroom behavior of one of the four teachers while teaching the unit. Observation of the four teachers during planning sessions combined with analysis of think aloud and stimulated recall interview data revealed that the principal product of a unit planning session was a mental picture of the unit to be taught, the sequence of activities within it, and the students' probable responses. These mental plans were supplemented and cued by sketchy notes and lists of important points that the teachers wanted to be sure to remember. Smith and Sendelbach characterized the process of activating a unit plan as one of reconstructing the plan from memory, rather than of carefully following the directions provided in the teacher's guide.

Smith and Sendelbach argued that the lack of a strong connection between the published curriculum and instruction created the potential for distortions or significant omissions in the content of science instruction. From their classroom observations of one experienced teacher implementing her unit plan, they concluded that the quality of instruction was degraded somewhat by both planned and unintended deviations from the SCIS curriculum. They attributed these deviations to the teacher's limited subject matter knowledge, difficulty in finding information in the teacher's guide, and to the presence of inherently complex and confusing concepts.

Summary. Three points are of special interest concerning the types and functions of teacher planning. First, researchers on teacher planning have tended to focus on a single type of planning and to study teachers at only the elementary level. To fully understand the task demands of teaching and the ways in which teachers respond to these demands, researchers need to describe the full range of kinds of planning that teachers do during the school year and the interrelationships between these kinds of planning. Second, the modest to insignificant role of lesson planning reported by experienced teachers is interesting. Lesson planning is the one type of planning that is addressed directly in all teacher preparation programs. Yet lesson planning is rarely claimed as an important part of the repertoire of experienced teachers. Perhaps differences between expert and novice teachers dictate that teacher education focus heavily on lesson planning. But this anomaly may also indicate that some of our teacher preparation practices bow more to the task demands of the university calendar, methods courses, and supervision models than to those of the public school environment. Finally, the functions of teacher planning that are not directly and exclusively concerned with a particular instructional episode seem to have been slighted in the research literature. Researchers and teacher educators should think more broadly about what teachers are accomplishing in their planning time and avoid narrow comparisons of what was planned with what was taught as the major criterion for evaluation of planning quality.

What Models Describe Teacher Planning?

The second major question asked by researchers on teacher planning is, "What models describe the planning process?" The logic of an industrial production system underlies the most widely prescribed model for teacher planning, first proposed by Tyler (1950). This linear model consists of a sequence of four steps: (a) specify objectives, (b) select learning activities, (c) organize learning activities, and (d) specify evaluation procedures. This linear model has been recommended for use at all levels of educational planning, and thousands of educators have been trained in its use. It was not until 1970 that researchers began to examine directly the planning processes in use by teachers and to compare what was being practiced with what was prescribed. Table 2 summarizes the studies conducted by these researchers.

Taylor's (1970) study of teacher planning in British secondary schools was directed toward examining how teachers planned syllabi for courses. Using group discussions with teachers, analyses of course syllabi, and a questionnaire administered to 261 teachers of English, science, and geography, Taylor came to the following general conclusions: The most common theme in the teachers' course planning was the prominence of the pupil, especially pupil needs, abilities, and interests. Following the pupil as a focus of planning, in order of importance, were the subject matter, goals, and teaching methods. In planning for courses of study, teachers attributed little importance to evaluation and to the relationship between their own courses and the curriculum as a whole.

Taylor described the course planning process as one in which the teacher begins with the context of teaching; next considers learning situations likely to interest and involve pupils; and, only after this, considers the purposes that teaching would serve. Taylor indicated that

Table 2

Ten Studies of the Planning Process: Summary of Findings

Study	Method of Inquiry	Teachers	Subject Matter	Principal Findings
Clark & Yinger (1979)	Journal keeping, interviews, & observations.	5 elementary teachers.	Writing	Two styles of planning consistent with the general features of Yinger's model: 1. Comprehensive planning 2. Incremental planning
Favor-Lydecker (1981)	Think aloud.	7 upper elementary teachers & 4 undergraduates.	Social Studies	Five different styles of planning.
McLeod (1981)	Stimulated recall.	17 kindergarten teachers.	Various	1. Intended learning outcomes considered during planning, while teaching, and after teaching. 2. Types of intended learning outcomes: Cognitive - 57.7% Social/affective - 35% Psychomotor/perceptual - 7.2%
Morine-Dershimer & Vallance (1976)	Analysis of written plans for an experimenter-prescribed lesson.	20 teachers of 2nd & 5th grades.	Reading & Mathematics	1. Outline form for most plans; fairly specific. 2. Little attention to behavioral goals, diagnosis of student needs, evaluation, or alternative courses of action.
Neal, Pace & Case (1983)	Questionnaire & interview.	19 elementary teachers & 9 student teachers.	Elemenatary planning	1. Attitudes toward systematic planning model favorable by teachers and student teachers. 2. Experienced teachers believed that the systematic model is useful primarily for novices and, occasionally, when planning a new unit. 3. Student teachers used the systematic planning model only when required to.
Peterson, Marx, & Clark (1978)	Think aloud; teaching in laboratory setting.	12 junior high school teachers.	Social Studies	1. Largest proportion of planning time on content. 2. 2nd focus = instructional strategies & activities. 3. Smallest % = objectives.

Table 2 (continued)

Ten Studies of the Planning Process: Summary of Findings

Study	Method of Inquiry	Teachers	Subject Matter	Principal Findings
Sardo (1982)	Observation & interview.	4 junior high school teachers.	English, Mathematics, Social Studies, Spanish/French	1. Least experienced teacher planned according to Tyler linear model. 2. "Content" decisions most frequently made first in planning (51%), followed by learning objectives 28%).
Taylor (1970)	Group discussions, analysis of course syllabi & questions.	261 British secondary teachers.	English, Science, Geography	1. Major focus of planning (in order of importance: a) pupil needs, abilities, & interests; b) subject matter; c) goals; d) teaching methods. 2. Evaluation was little importance in course planning. 3. Little concern for relationship of planned course to the curriculum as a whole.
Yinger (1977)	Ethnography, observation, & interview.	1 teacher of combined grades 1 & 2.	All	Three stage, cyclical planning model: 1. Problem finding. 2. Problem formulation and solution. 3. Implementation, evaluation, and routinization.
Zahorik (1975)	Quesionnaire	194 elementary teachers.	Elementary planning.	1. "Pupil activities" was the most frequently reported focus of planning (81%). 2. "Content" decisions most frequently made first in planning (51%), followed by learning objectives (28%).

teachers gave minor importance to the criteria and procedures for evaluating the effectiveness of their course of teaching. Taylor concluded that in curriculum planning teachers should begin with the content to be taught and accompanying important contextual considerations (e.g., time, sequencing, resources). Teachers should then consider pupil interests and attitudes, aims and purposes of the course, learning situations to be created, the philosophy of the course, the criteria for judging the course, the degree of pupil interest fostered by the course, and finally, evaluation of the course.

Zahorik (1975) continued this line of inquiry in a study in which he asked 194 teachers to list in writing the decisions they made prior to teaching and to indicate the order in which they made them. He classified these decisions into the following categories: objectives, content, pupil activities, materials, diagnosis, evaluation, instruction, and organization. He found that the kind of decision mentioned by the greatest number of teachers concerned pupil activities (81%). The kind of decision most frequently made first concerned content (51%), followed by decisions about learning objectives (28%). Zahorik concluded that teachers' planning decisions do not always follow linearly from a specification of objectives and that, in fact, objectives are not a particularly important planning decision in terms of quantity of use.

More recently, researchers have turned their attention to describing teacher planning by observing and audiotaping teachers' thinking aloud during planning sessions. Peterson, Marx, and Clark (1978) examined planning in a laboratory situation as 12 teachers prepared to teach a new instructional unit to small groups of junior high school students with whom they had had no previous contact. During their planning periods, teachers were instructed to think aloud, and their verbal statements were later coded into planning categories including objectives, materials, subject matter, and instructional process. The primary findings of this study were: (a) teachers spent the largest proportion of their planning time dealing with the content to be taught; (b) after subject matter, teachers concentrated their planning efforts on instructional processes (strategies and activities); and (c) teachers spent the smallest proportion of their planning time on objectives. All three of these findings were consistent with those of Zahorik (1975), and Goodlad and Klein (1970). The third finding was also similar to results reported by Joyce and Harootunian (1964) and by Popham and Baker (1970).

In interpreting the Peterson, Marx, and Clark (1978) study, one needs to consider the task demands on the teachers. The researchers provided the teachers with unfamiliar materials from which to teach, and they limited preparation time to 90 minutes immediately preceding teaching on each day of the study. Because the teachers did not know their students in advance, the teachers may have placed more emphasis on content and instructional processes in their planning than would normally be the case. Finally, the researchers provided the teachers with a list of six general teaching goals, expressed in terms of content coverage, process goals, and cognitive and attitudinal outcomes for students. Under these circumstances, it is not surprising that the teachers devoted little planning time to composing more specific objectives and used the largest part of their planning time to study the content and decide how to teach it.

Morine-Dershimer and Vallance (1976) obtained results consistent with those of Peterson, Marx, and Clark. Morine-Dershimer and Vallance collected written plans for two experimenter-prescribed lessons (one in mathematics and one in reading) taught by 20 teachers of second and fifth grades in their own classrooms to a small group of their students. The researchers described teachers' plans in terms of (a) specificity of written plans, (b) general format of plans, (c) statement of goals, (d) source of goal statements, (e) attention to pupil background and preparation, (f) identification of evaluation procedures, and (g) indication of possible alternative procedures. Teachers tended to be fairly specific and use an outline form in their plans. Their written plans reflected little attention to behavioral goals, diagnosis of student needs, evaluation procedures, and alternative courses of action. However, the teachers reported that writing plans for researcher-prescribed lessons was not typical of their planning, and observations of their classroom teaching behavior revealed that much of what the teachers had planned was not reflected in their written outlines (Morine-Dershimer, 1979).

In his five-month field study of one teacher, Yinger (1977) drew on his observations, interview data, and think-aloud protocols to create a theoretical model of the process of teacher planning. He viewed teacher planning as taking place in three stages. The first stage is a discovery cycle in which the teacher's goal conceptions, her knowledge and experience, her notion of the planning dilemma, and the materials available for planning interact to produce an initial problem conception worthy of further exploration. The second stage is problem formulation and solution. Yinger proposed that the mechanism for carrying out this process is the "design cycle." He characterized problem solving as a design process involving progressive elaboration of plans over time. Moreover, he proposed that elaboration, investigation, and adaptation are the phases through which teachers formulate their plans. The third stage of the planning model involves implementation, evaluation, and eventual routinization of the plan. Yinger emphasized that evaluation and routinization contribute to the teacher's repertoire of knowledge and experience, which in turn play a major role in the teacher's future planning deliberations.

A significant contribution of Yinger's way of conceptualizing the planning process is that he proposes a cyclical rather than a linear model. He postulates a recursive design cycle similar to the processes hypothesized to go on in the work of architects, physicians, artists, designers, and other professionals. In addition, he acknowledges that schooling is not a series of unrelated planning-teaching episodes, but that each planning event can be influenced by prior planning and teaching experiences and that, potentially, each teaching event feeds into future planning and teaching processes. He represents the cycle as a continuous, year-long process, in which the boundaries between planning, teaching, and reflection are not sharp and distinct.

In a further investigation of the Yinger model, Clark and Yinger (1979b) asked five elementary teachers to design and plan a two-week unit on writing that the teachers had never taught before. The teachers kept journals documenting their plans and their thinking about planning during a three-week period, and they were interviewed twice each week. The journal keeping and interviews continued and were supplemented by observations during the two-week period when the teachers were implementing their plans.

Clark and Yinger described the teachers' unit planning as a cyclical process, typically beginning with a general idea and moving through phases of successive elaboration. This tendency of teachers to mentally visualize, elaborate, and modify their plans was further supported by data from a later study of teacher judgment while planning (Yinger & Clark, 1982; 1983). In that study, six teachers who thought aloud while making judgments about published language-arts activity descriptions were seen to change and adapt the activity descriptions to fit their own teaching situations and experiences before passing judgment about the quality and usefulness of the activities. Visualization of the teaching activity being enacted in the specific context of their own classrooms seemed to be an essential feature of the planning process for these experienced elementary school teachers. One could hypothesize that the availability of detailed knowledge structures about a particular teaching setting provides the experienced teacher with the tools for mentally trying out learning activities and distinguishes the expert planner from the novice.

In the Clark and Yinger (1979b) study of unit planning, two of the teachers' unit plans consisted of a short problem-finding stage, brief unit planning, and considerable reliance on trying out activities in the classroom. Clark and Yinger referred to this approach as "incremental planning" and described teachers who employed a series of short planning steps, relying heavily on day-to-day information from the classroom. They characterized the remaining three unit plans as products of "comprehensive planning," in which the teachers developed a thoroughly specified framework for future action. When compared with incremental planning, comprehensive planning involved more attention to the unit as a whole, and more time and energy invested in specifying plans as completely as possible before beginning to teach. Both approaches to unit planning seemed to work well for the teachers who used them. Incremental planning saved time and energy while staying in touch with changing student states. Comprehensive planning provided a complete and dependable guide for teacher-student interaction for the whole course of a unit, reducing uncertainty and increasing the probability of achieving prespecified learning objectives.

This notion of "planning styles" of teachers was examined further by Sardo (1982). She found a relationship between individual differences in planning style and amount of teaching experience. Sardo studied the planning of four junior high school teachers who varied in teaching experience from 2 to 30 years. The planning of the least experienced teacher consisted primarily of daily and lesson planning and followed the Tyler linear model most closely, while the more experienced teachers tended to be less systematic planners, to spend less time planning, and to concern themselves with planning the flow of activities for an entire week rather than with the fine details of each lesson.

Similarly, Favor-Lydecker (1981) studied the social studies unit planning styles of 17 teachers of upper-elementary grades (4-6) and of four advanced undergraduate elementary education majors. Each of the 21 teachers thought aloud during a two-hour planning session for a unit on ethnic heritage. Favor-Lydecker described five different planning styles that characterized the 21 unit plans: (1) teacher-student cooperative planning, (2) brainstorming, (3) list and sequence planning,

(4) culminating event in sequence planning, and (5) culminating event as goal statement planning.

One recent study tested the possibility that the reported rarity of use of the Tyler model of planning might be due to inadequate training of teachers in its use or to unsupportive contextual factors. In an interview study, Neal, Pace, and Case (1983) contrasted student teachers (n = 9) and experienced elementary and special education teachers (n = 19) in their attitudes toward and use of the Tyler systematic planning model. They found that both undergraduates and experienced teachers expressed moderately favorable attitudes toward the systematic planning model, but that experienced teachers believed it was useful mainly for student teachers and not for themselves. Five of the 19 experienced teachers reported using the systematic planning model only when developing a new unit, and the remaining 14 teachers reported that they did not use the model at all because they believed that it took too much time, was unnecessary, or was implicitly rather than explicitly included in their informal planning. The student teachers reported that they followed the systematic planning model closely when they were required to do so in planning two sample lessons, but, when not specifically required to, most reported not using this model in planning practice teaching lessons. The results of this study contradict the hypothesis that teachers do not use the systematic planning model because they are not well trained in its use or because the organizational environment is not supportive. Novice and experienced teachers alike demonstrated knowledge of the model, and the teaching environment (a mastery learning system) was organizationally supportive of it. Yet the systematic planning model was not the approach of choice for either beginning or experienced teachers.

McLeod (1981) provided a new perspective on the role of learning objectives in planning by asking not whether objectives are the starting point for planning but rather when teachers think about objectives. Working with 17 kindergarten teachers, McLeod conducted a stimulated-recall interview with each teacher, using a videotape of a 20-minute to 30-minute classroom activity taught by the teacher earlier that same day. The purpose of the interviews was to determine when teachers formulated intended learning outcomes in terms of four stages: Preactive Stage 1 (before planning activities or selecting materials), Preactive Stage 2 (after planning but before teaching), Interactive Stage 3 (during the act of teaching), and Postactive Stage 4 (during reflection after a teaching episode) (after Pylypiw, 1974). The interviews were also used to determine what types of intended learning outcomes (cognitive, social, and psychomotor) teachers formulated at each stage.

Averaging the responses across the 17 teachers, McLeod found that the largest percentage of intended learning outcomes was identified during the interactive stage (45.8%). This was followed by Preactive Stage 1 (26.5%), Preactive Stage 2 (19.5%), and by the Postactive Stage (8.2%). The data also indicated that 57.7% of the intended learning outcomes were cognitive, 35% were social or affective, and 7.2% were psychomotor or perceptual. Interestingly, teachers reported identifying social/affective intended learning outcomes primarily during the Interactive Stage, and cognitive outcomes predominantly during the Preactive and Postactive Stages.

Unfortunately, in her investigation, McLeod relied primarily on stimulated-recall interviews. She could have supplemented the stimulated-recall data to good effect with classroom observations and with thinking aloud techniques to describe the use of learning outcomes as it was happening. However, this research does much to broaden the concept of goals, objectives, or intended learning outcomes and their roles in planning and teaching. In earlier studies researchers tended to dismiss learning objectives as a rare and, therefore, unimportant element in teacher planning, even characterizing teachers as interested only in activities rather than in outcomes. McLeod's study suggests that teachers can and do think about and act to support both specific and general learning outcomes for their students and that it is hazardous to study the process of teacher planning in isolation from interactive teaching and postactive reflection.

The role of student learning outcomes in planning and teaching has been examined by several other researchers as well (e.g., Connelly, 1972; Eisner, 1967; Eisner & Vallance, 1974; Raths, 1971; Toomey, 1977; and Wise, 1976). The concensus seems to be that planning for teaching necessarily involves the teacher's intentions for learning, but that the degree of specificity and explicitness of these intentions varies with the teacher's conception of the teaching-learning process. Toomey (1977) found, for example, that compared with more process-oriented and student-centered teachers, teachers characterized as content and teacher-control oriented tended to be very specific in their articulation and use of student learning objectives.

Teacher Planning and Teachers' Classroom Behavior

The third and final question concerns the link between teacher planning and action in the classroom. Researchers have demonstrated that teachers' plans influence the content of instruction and the sequence of topics (e.g., Smith & Sendelbach, 1979; Clark & Elmore, 1981) as well as the time allocations to elementary school subject matter areas (Smith, 1977). Now we turn to the few studies in which researchers have examined how teachers' plans influence what happens in the classroom. Table 3 presents the principal findings of these studies.

Zahorik (1970) compared the effects of structured planning with the absence of structured planning on teachers' classroom behavior. He provided 6 of 12 teachers with a partial lesson plan containing behavioral objectives and a detailed outline of content to be covered two weeks hence. He requested that the remaining 6 teachers reserve an hour of instructional time to carry out a task for the researchers, not telling them that they were going to be asked to teach a lesson on credit cards until just before the appointed time. Zahorik analyzed recorded protocols of the 12 lessons focusing on "teacher behavior that is sensitive to students" (p. 144). He defined this behavior as "verbal acts of the teacher that permit, encourage, and develop pupils' ideas, thoughts, and actions" (p. 144). In comparing the protocols of the planners and non-planners, Zahorik judged that teachers who had been given plans in advance exhibited less honest or authentic use of the pupils' ideas during the lesson. He concluded from this that the linear planning model--goals, activities and their organization, and

Table 3

Four Studies of Links Between Planning and Action: Summary of Findings

Study	Method of Inquiry	Teachers	Subject Matter	Principal Findings
Carnahan (1980)	Analysis of written plans & classroom observations.	9 teachers of 5th grade.	Mathematics	Positive correlation between planning statements about small group instruction and observed use of small group instruction.
Hill, Yinger, & Robbins (1981)	Observation, interview & analysis of written plans.	6 teachers of pre-school.		Planning concerned with selection of materials and arrangement of physical environment of classroom.
Peterson, Marx, & Clark (1978)	Think aloud, observation.	12 junior high school teachers.	Social Studies	Positive correlations between focus of planning behavior and focus of interactive teaching behavior.
Zahorik (1970)	Classroom observation.	12 elementary teachers.	Lesson on credit cards.	Teachers given plans 2 weeks in advance noted as behaving "less sensitively toward students" than teachers not given plans.

evaluation--resulted in insensitivity to pupils on the part of the teacher.

Unfortunately, Zahorik did not determine the degree to which the teachers who received the lesson plans in advance actually planned or elaborated the lesson. A competing explanation for these findings is that the teachers who had no advance warning about what they were to teach were forced by the demands of the task to concentrate on their students' ideas and experiences, while those teachers who knew the expected topic of instruction for two weeks prior to teaching were influenced to focus on the content rather than on their students.

In the Peterson, Marx, and Clark (1978) laboratory study of teacher planning, teaching, and student achievement described earlier, a number of positive relationships emerged between the focus of teachers' planning statements and their classroom behavior. For all teachers, planning on the first of three days of teaching was heavily weighted toward the content to be covered. However, the focus of their planning shifted on days two and three, with planning for instructional processes becoming more prominent. The proportion of planning statements dealing with the learner was positively related to teacher behaviors classified as "group focused." The proportion of planning statements dealing with the content was positively and significantly correlated with teacher behavior coded as "subject matter focused." These findings suggest that teacher planning was related to the general focus or tone of interactive teaching, rather than to the specific details of verbal behavior. They also suggest that the nature of the work done during the preactive planning period changes with situation-specific teaching experience. As the task demands on the teacher change, so does the nature of appropriate preparation.

Carnahan (1980) studied the planning and subsequent behavior of nine fifth-grade teachers as they taught the same two-week mathematics unit. The quality of the teachers' written plans was determined by rating plans that focused on large groups as low in quality and plans that focused on individuals or small groups as high in quality. (This criterion was chosen because the curriculum materials that the teachers were using incorporated a similar bias.) Classroom observers rated instruction for teacher clarity, use of motivation strategies, and student engagement. The main result of interest here is that Carnahan found no statistically significant relationship between his ratings of plan quality and the ratings of teaching quality. However, he did find a significant positive correlation between the total percentage of written planning statements about small groups or individuals and the observed use of small groups in the classroom. This and other findings in Carnahan's report indicate that the main relationship between written plans and subsequent classroom interaction was in the domain of organization and structuring of teaching rather than in the domain of specific verbal behavior. During interactive teaching, the responses of students are unpredictable and therefore verbal dialogue may not be a profitable focus for teacher planning.

The influence of teacher planning on classroom behavior in the teaching of preschool children seems to be somewhat different from that observed in higher grades. Hill, Yinger, and Robbins (1981) studied the planning of six teachers who constituted the staff of a university developmental preschool. During a 10-week period, the researchers observed the teachers' Friday afternoon group planning sessions, staff meetings, conferences with student teachers, materials selection from the storeroom, and their arranging of their classroom environments. They also interviewed the teachers about their planning processes and copied planning documents and records.

Hill, Yinger, and Robbins found that much of the teachers' planning centered around selecting and arranging manipulable materials. The school storeroom was an important source of teachers' ideas for learning activities. Once the teachers identified the appropriate materials, they then focused on how to arrange these materials in the classroom for use by the children and on how to manage the transitions into and out of these activities. The teachers spent three or more hours per week arranging the physical environments of their classrooms. When an activity did not go well, the teacher's first improvement strategy was to rearrange the physical environment. Because teaching in this setting depended so much on the materials selected and arranged by teachers, teacher planning had a substantial influence on the nature of the children's learning opportunities. Also, the demands of teaching appear to have influenced the nature of the planning process in this setting.

These four studies, taken together, suggest that teacher planning does influence opportunity to learn, content coverage, grouping for instruction, and the general focus of classroom processes. They also highlight the fact that the finer details of classroom teaching (e.g., specific verbal behavior) are unpredictable and therefore not planned. Planning shapes the broad outline of what is possible or likely to occur while teaching and is used to manage transitions from one activity to another. But once interactive teaching begins, the teacher's plan moves to the background and interactive decision making becomes more important.

Summary of Research on Teacher Planning

Research on teacher planning provides a direct view of the cognitive activities of teachers as professionals. This literature is almost exclusively descriptive and deals primarily with the planning of experienced elementary teachers. The research indicates that there are as many as eight different types of planning that teachers engage in during the school year. These types of planning are not independent, but are nested and interact with one another.

The curriculum as published is transformed in the planning process by additions, deletions, changes in sequence and emphasis, teachers' interpretations, and misunderstandings. Other functions of teacher planning include instructional time allocation for subject matters and for individuals and groups of students, study and review of the content of instruction by teachers, organization of daily, weekly, and term schedules, meeting administrative accountability requirements, and communicating with substitute teachers. Teachers also report that the planning process produces immediate psychic rewards in the form of feelings of confidence and reduction of uncertainty. Taken together, these findings suggest that teacher planning has direct connections with variables studied in the general literature of research on teaching such as structuring, opportunity to learn, and time on task. Teacher planning also seems to be an appropriate topic of inquiry for researchers studying implementation of educational innovations.

The task of modeling the planning processes of teachers is far from complete. The literature is in reasonable agreement that a narrowly construed version of the linear "rational planning model" proposed by Tyler does not describe the planning behavior of experienced teachers. But it is not clear whether the several styles and models of planning described by Yinger, Toomey, Favor-Lydecker, and others are functionally superior to the Tyler model. Furthermore, it may be that training novice teachers to use a version of the Tyler model provides them with an appropriate foundation for developing a planning style compatible with their own personal characteristics and with the task environments in which they must teach. Continued study of the planning behavior of teachers might be more profitable if researchers shift to longitudinal designs and a cognitive-developmental framework instead of continuing to accumulate descriptions of the planning of experienced teachers.

Teacher planning reduces but does not eliminate uncertainty about teacher-student interaction. Classroom teaching is a complex social process that regularly includes interruptions, surprises, and digressions. To fully understand the operation of teacher planning, researchers must look beyond the empty classroom and study the ways in which plans shape teacher and student behavior and are communicated, changed, reconstructed, or abandoned in the interactive teaching environment.

Teachers' Interactive Thoughts and Decisions

Researchers on teachers' thinking have attempted to describe the thinking that teachers do while interacting with students in the classroom. More specifically, researchers have been concerned with the extent to which teachers make interactive decisions that lead them to change their plans or their behavior in the classroom. For example, while teaching a lesson, a teacher may make a decision to continue with the teaching strategy that s/he had planned to use or not to continue with the strategy as a result of a decision. Researchers have attempted to map the interactive decisions of teachers and describe the influences on teachers' interactive decisions as well as to identify the cues that the teachers use to make interactive decisions. Finally, researchers have investigated the relationships among teachers' interactive thoughts and decisions, teachers' behavior, and student outcomes. An important question here is whether teachers who are considered effective in producing positive gains in student achievement differ in their patterns of interactive decision making from teachers who are considered less effective in promoting student achievement.

In the following sections, we will review the research on teachers' interactive thoughts and decisions that has addressed each of the above topics. We will discuss findings on the broader topic of the content of teachers' interactive thoughts and then move to a more narrow focus on findings related to teachers' interactive decision making. First, we will provide an overview of the methodology used in these studies.

Overview of Studies Using Stimulated-Recall Techniques to Study Teachers' Interactive Thoughts and Decisions

Table 4 presents a summary of the method and procedures of 12 research studies in which researchers used stimulated-recall interviews to elicit self-reports of teachers' interactive thoughts and decisions. As can be seen from Table 4, the 12 studies varied considerably in the grade level and experience of the participants, the number and subject matter of the lessons that were videotaped and used in the

Table 4

Studies of Teachers' Interactive Thoughts and Decisons Using Stimulated-Recall Interviews

	Participants				Format of Stimulated-Recall Interview		
Study	Teachers	Students	Setting	Number and Type Lesson Videotaped	Type of Videotaped Segments Used as Stimuli	Type of Interview	Coding and Analysis of Stimulated-Recall Interview
Colker (1982)	6 Experienced 1st and 2nd-Grade Teachers.	Intact Classes of the Six Teachers.	Classroom	Three Mathematics Lessons: One to a Single Student; One to a Small Group; and One to a Large Group.	Entire Tape Viewed Twice: Teacher Stopped Tape During First Viewing; E Stopped Tape During Second Viewing.	No Questions (Only Teacher Comments) During First Viewing; Structured Questions During Second Viewing.	"Thought Units" Tallied and Categorized.
Conners (1978b)	9 Teachers, One Each From 1st, 3rd and 6th Grades in Three Schools in Canada; Each had 2 or More Years Experience.	Intact Classes of the Nine Teachers.	Classroom	One 30-60 Minute Language Arts Lesson; One 30-60 Minute Social Studies Lesson.	Same as Marland Except E "Played a More Active Role" in Selecting Segments.	Clinical Interview With Some Specified Open-Ended Questions.	"Thought Units" Tallied and Categorized; Ecological Factors and Teachers' Principles, Beliefs and Rules Identified and Tallied.
Fogarty, Wang, & Creek (1982)	8 Teachers From Lab School, One Pre-school, and Two Experienced 1st/2nd Grade Teachers; Four Pre-service and One Experienced 3rd/4th/5th Grade Teachers.	Small Group of 5-8 Students Selected From Each Teacher's Intact Class.	Classroom	One 15-Minute Lesson (6 Teachers Taught a Reading or Language Arts Lesson; One Taught Mathematics; One Taught Social Studies.)	Teacher Viewed Entire Videotape and Stopped It When (s)he Recalled Any Thoughts or Decisions; E Could also Stop Tape.	Clinical Interview With Some Specified "Probe" Questions.	"Decisions" Identified; Aspects of Decisions Tallied and Categorized.
Housner & Griffey (1983)	8 Experienced Elementary Physical Education Teachers and 8 Pre-Service Elementary Physical Education Teachers.	4 Children ages 7 to 9 Years, Not Previously Acquainted With the Teachers.	Laboratory	Two 24-Minute Lessons; One on Soccer and One on Basketball Dribbling.	Six 4-Minute Segments of Each Lesson Selected by Experimenter.	Structured Interview (Same Questions as Peterson & Clark).	"Decisions" Categorized; Aspects of Decisions Tallied and Categorized.
Lowyck (1980) (Also, De Corte & Lowyck, 1980)	18 5th Grade Teachers in Belgium.	Intact Classes of the 18 Teachers.	Classroom	One Mathematics Lesson and One Geography Lesson; Topics Provided by E. (Same for all Teachers).	Teacher viewed Entire Videotape. (Interview Lasted 3-5 Hours and Did Not Occur on Same Day as Videotaping.)	Clinical Interview	Content Analysis (Specific Procedures Not Specified.)
Marland (1977) (Also, MacKay & Marland, 1978)	6 Teachers, One Each from 1st, 3rd, and 6th Grades in Two Schools in Canada.	Intact Classes of the Six Teachers.	Classroom	One One-Hour Language Arts Lesson and One One-Hour Math Lesson.	Teacher Viewed Entire Videotape and Decided When to Stop the Videotape and Reflect on His/Her Thought Processes; E Could also Stop Tape.	Clinical Interview	"Thought Units" Tallied and Categorized; Type and Aspects of Decisions Tallied and Categorized; "Principles of Teaching" Identified.

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Table 4 (continued)

Studies of Teachers' Interactive Thoughts and Decisions Using Stimulated-Recall Interviews

	Participants			Format of Stimulated-Recall Interview			
Study	Teachers	Students	Setting	Number and Type Lesson Videotaped	Type of Videotaped Segments Used as Stimuli	Type of Interview	Coding and Analysis of Stimulated-Recall Interview
McNair (1978-79)	10 Teachers from One School in Grades 1-5 with 3 Years or More Experience.	2 Intact Reading Groups (1 More Able; 1 Less Able) in Each Teacher's Class.	Classroom	One Reading Lesson with Each of the 2 Groups 3 Times During the Year.	Teacher Viewed Entire Videotape and Stopped it When (s)he "Made a Decision;" Experimenter also Stopped Tape Systematically and at Random.	Structured Interview	"Thought Units" Tallied and Categorized.
Morine & Vallance (1975)	10 "More Effective" and 10 "Less Effective" 2nd Grade Teachers; 10 "More Effective" and 10 "Less Effective" 5th Grade Teachers.	12 Students Randomly Selected From Within Each Teacher's Intact Class.	Classroom	One 20-Minute Reading Lesson; Topic and Curriculum Materials Provided by E.	Same as McNair (1978)	Structured Interview (Same Questions as McNair)	"Decisions" Identified and Categorized; Aspects of Decisions Tallied and Categorized.
Peterson & Clark (1978) (Also, Marx, & Peterson, 1981; Clark & Peterson 1981)	12 Experienced Teachers.	3 Groups of 8 Randomly Assigned 7th and 8th Grade Students not Previously Acquainted with the Teachers.	Laboratory	One Two and One-Half Hour Social Studies Lesson Taught to Each of the Three Groups of Students; Curriculum Materials Provided by E.	First Five Minutes of the Lesson and Three Short Segments Randomly Selected by Experimenter E.	Structured Interview	"Thought Units" Tallied and Categorized; "Decision Paths" Identified and Categorized.
Semmel (1977) (Also, Semmel, Brady & Semmel, 1978)	20 Preservice Special Education Teachers.	1 Student Tutee With a Severe Reading Deficit Assigned to Each Teacher.	Classroom	One Oral Reading Lesson was Audiotaped.	Entire Tape Played Back; E Stopped Tape After Each Pupil "Miscue."	Structured Interview	"Statements" Tallied and Categorized.
Shroyer (1981)	1 Female 4th/5th-Grade Teacher; One Male and One Female 5th/8th Grade Teacher; Each Had at Least 4 Years Experience.	The 3 Teachers' Intact Classes.	Classroom	A One to Two-Week Mathematics Unit on Rational Numbers.	Teacher Viewed Entire Tape and Stopped Tape to Reflect on Thoughts, Feelings, and Decisions.	Clinical Interview (Similar to Conners)	"Critical Moments" Identified, Tallied and Categorized.
Wodlinger (1980)	1 Female 8th-Grade Teacher in Canada With Four Years of Teaching Experience.	The Teacher's Intact Class of 28 Students.	Classroom	Ten 30-45 Minute Lessons (1 Language Arts, 3 Mathematics, 3 Reading, 2 Spelling Lessons; 1 Group Discussion)	Teacher Viewed Entire Videotape and Provided Running Account of Her Interactive Decisions.	Clinical Interview With "General" and "Focused" Questions.	Decision-Related Data Categorized into "Thought Units," "Decisions," and Aspects of Decisions Tallied and Categorized.

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stimulated-recall interview, and the actual format of the stimulated-recall interview. Eleven of the 12 studies were done with elementary teachers and students from grades one through six, and one study was done with seventh- and eighth-grade students. Although most studies included several teachers, each teaching more than one lesson, Wodlinger (1980) focused on only one teacher, and several investigators taped only one lesson for each teacher (Fogarty, Wang, & Creek, 1982; Morine & Vallance, 1975; Semmel, 1977). The subject matter of the lessons varied considerably across the 12 studies and included reading, language arts, spelling, mathematics, social studies, and physical education. To illustrate how the format of the stimulated-recall interview differed, we will describe one study and then use it as a basis for comparison.

In a laboratory study of teachers' interactive thoughts and decisions, Peterson, Clark, and Marx (Peterson & Clark, 1978; Marx & Peterson, 1981; Clark & Peterson, 1981) had 12 experienced teachers each teach a two and one-half hour social studies lesson to three groups of seventh- and eighth-grade students. Teachers were videotaped while they were teaching. At the end of each lesson, each teacher viewed the videotape of the first 5 minutes of the first hour of teaching and three 1-3 minute segments of each hour of instruction to "stimulate recall" of their interactive thoughts during instruction. After viewing each of these four segments, the teachers responded to the following questions:

1. What were you doing in the segment and why?
2. Were you thinking of any alternative actions or strategies at that time?
3. What were you noticing about the students?
4. How were the students responding?

5. Did any student reactions cause you to act differently than you had planned?

6. Did you have any particular objectives in mind in this segment? If so what were they?

7. Do you remember any aspects of the situation that might have affected what you did in this segment?

In contrast to the above study and the study by Housner and Griffey (1983) where teachers viewed only selected segments of the videotape of their lessons, teachers viewed the entire videotape in eight studies (Morine & Vallance, 1975; Marland, 1977; Conners, 1978b; McNair, 1978-79; Lowyck, 1980; Wodlinger, 1980; Fogarty et al., 1982; & Shroyer, 1981), listened to the entire audiotape of their lesson in one study (Semmel, 1977), and viewed the entire videotaped lesson twice in one study (Colker, 1982). However, even in these studies where the interviewer played the entire tape to the teacher, the procedure differed according to whether the teacher selected the videotaped segments that were the focus of the interview (as in the Lowyck, Wodlinger, & Shroyer studies), whether the teacher and interviewer were both allowed to select segments that were the focus of the interview (as in the Morine & Vallance, Marland, McNair, Conners, and Fogarty et al. studies), or whether the interviewer selected the segments that were the focus of the interview (as in the Semmel & Conners studies). Moreover, in the Peterson, Marx, and Clark study and in the studies by Morine and Vallance, Housner and Griffey, Semmel, McNair, and Colker, teachers responded to a structured interview with a prespecified set of questions. In contrast, in the studies by Marland, Conners, Lowyck, Wodlinger, and Shroyer, the format of the stimulated-recall interview was a clinical one in which a few general and specific questions were predetermined by the researchers, but the actual questions varied from interview to interview as determined by the interviewer.

Although the format of the stimulated-recall interviews differed considerably across the 10 studies, the coding and analysis of the stimulated-recall interviews were similar in all the studies. The teachers' responses to the interview were audiotaped and coded by categorizing each of the teacher's statements or "thoughts" into one of several categories. The number of complete thoughts in each category was then tallied and compared across content categories. We turn now to the findings from these studies.

The Content of Teachers' Interactive Thoughts

Six studies have described the content of teachers' interactive thoughts. These are Marx and Peterson (1981), McNair (1978-79), Colker (1982), Marland (1977), Conners (1978b), and Semmel (1977). Despite the variability in the methodology used in these six studies, the findings are remarkably similar. Table 5 presents the percentage of teachers' interactive thoughts by content category across the six research studies. In this table, we placed similar categories side-by-side so as to permit comparison of the percentage of teachers' interactive thoughts in similar categories across studies.

Several findings emerge from an examination of Table 5. First, a relatively small portion of teachers' reports of their interactive thoughts dealt with instructional objectives. Teachers mentioned objectives only 14% or less of the time across the four studies that used objectives as a category. Examples of teachers' reports of interactive thoughts about objectives include the following:

Table 5

Percentage of Teachers' Interactive Thoughts by Content Category Across Six Research Studies

Marx & Peterson		McNair		Colker		Marland		Conners		Semmel	
Category	%	Category	%	Category	%	Category	%	Category	%	Category	%
Objectives	13.9	Objectives	2.9			Goal Statementn	2.7	Objectives	5.4		
Content	6.5	Content: Facts & Ideas	13.6					Content	5.5		
Instructional Procedures	30.9	Procedures & Task	28.8			Tactical Deliberations	23.5	Instructional moves	21.7	Instruction and/or text	19.2
Materials	6.1	Materials	8.9								
Learner	42.2	Learner	39.1	Learner	41.4	[Total Learner	50.0]	[Total Learner	44.1]	Learner	59.6
						Information:Pupil	6.8	Information:Pupil	8.7		
								Mediation:Pupil	1.3		
						Perceptions	15.8	Perceptions	15.8	Reiteration of Behavior	21.2
						[About Learner	14.4]	[About Learner	12.6]		
						Interpretations	11.9	Interpretations	16.8		
						[About Learner	11.6]	[About Learner	15.2]		
						Anticipation	8.6	Expectations	4.3		
						[About Learner	5.6]	[About Learner	4.3]		
						Reflections	18.8	Self-awareness	7.7		
						[About Learner	11.6]	[About Learner	1.0]		
						Information:Other	6.1	Information:Other	1.0		
								Beliefs	4.4		
						Feelings	5.6	Feelings	6.5		
						Fantasy	0.1				
				Other than Learner	58.6						
		Time	6.6								

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> I wanted them to see the connection between the "Sh" sound and the S-H, that they all had S-H's on them.
>
> I wanted them to identify the senses that they were using.

Second, a relatively small percentage of teachers' statements about their interactive thoughts dealt with the content or the subject matter (5% to 14% across three studies). An example of such a statement is,

> At this point here I wanted to focus in on the idea of Japan being today an industrial nation, rather than an agricultural nation.

Third, a relatively larger percentage of teachers' reports of their interactive thoughts dealt with the instructional process including instructional procedures and instructional strategies. The percentage was amazingly similar--20% to 30%--across the five studies that used a category like "instructional process" in their content analysis. Here are some examples:

> I thought after I explained it to her, "I didn't make that very clear."
>
> I was also thinking that I couldn't ask them to come down to the carpet one group at a time.
>
> I was thinking that they needed some sort of positive reinforcement.
>
> At this point in the lesson I felt I had reviewed what we had already talked about yesterday.
>
> I was trying to guide her into the sounding without actually having to do it.

Fourth, in all of the six studies the researchers found that the largest percentage of teachers' reports of their interactive thoughts were concerned with the learner. Examples included the following:

> I was thinking that they don't understand what they're doing.
>
> I was also thinking, "Tricia's kind of silly right now. If I ask her, I probably won't get a straight answer."
>
> I expected him to get that.
>
> You can't always tell with the kids you know, whether they're truly inattentive or whether they're just mulling over what has been going on.

.So they were concentrating on that.
And nobody was listening at all.

In the studies by Marx and Peterson, McNair, and Colker, the percentage concerned with the learner was approximately 40%. In the study by Semmel (1977), the percentage was higher (60%), perhaps because this was the only study in which teachers were dealing with exceptional children (i.e., children with a severe reading difficulty) or perhaps because in this study each teacher was teaching only one child. In contrast, Colker (1982) found no significant differences between teachers' reports of interactive thoughts about learners in a tutoring situation compared to a small-group situation or a large-group situation. Thus, the greater focus on the learner in the Semmel study is probably due to the fact that the students were exceptional children or possibly to the fact that the teachers were preservice rather than inservice teachers.

In the studies by Marland and Conners, a small percentage of teachers' reports of their interactive thoughts were categorized as "Information: Pupil." However, a further analysis of their data shows that a large proportion of teachers' statements about the learner were included in their four categories entitled, "perceptions," "interpretations," "anticipations" ("exceptions"), and "reflections" ("self-awareness"). The percentage dealing with the learner in each of these four categories is indicated in brackets in Table 5. If one adds together the percentages about the learner in each of these four categories with the category of pupil information, then the total percentage of teachers' reports of interactive thoughts dealing with the learner in the Marland study is 50%--a percentage that comes close to the percentages reported in the other four studies. If one conducts the same analysis on the categories in the Conners study, one finds that the total percentage of teachers' statements about the learner, including perceptions about the learner, interpretations about the learner, expectations about the learner, self-awareness about the learner, information, and mediation about the learner, is 44.1%.

In sum, then, *in all of the six studies, the greatest percentage of teachers' reports of interactive thoughts was concerned with the learner*. If one looks only at the studies in which normal learners were taught, the percentage of interactive thoughts reported about the learner was between 39% and 50%.

While the results in Table 5 present a consistent picture of the percentage of teachers' reports of interactive thoughts that fall into each of several broad categories (i.e., objectives, content, instructional process, and learner), they also suggest that it may be useful to subdivide these categories into more specific ones. In contrast to the categories used by Marx and Peterson (1981) and McNair (1978-79), Marland's (1977) categories reflect more of a "cognitive processes" description of teachers' interactive thoughts:

Perceptions: Units in which the teacher reported a sensory experience (e.g., was seen or heard).

Interpretations: Units in which the teacher attached subjective meaning to his perception.

Anticipations: Speculative thoughts or predictions made interactively about what could or was likely to occur in future phases of the lesson.

Reflections: Units in which the teacher was thinking about past aspects of, or events in, the lesson other than what he had done.

Conners (1978b) and Lowyck (1980) used similar categories to describe teachers' interactive thoughts. These categories come closer to describing the processes that teachers engage in during teaching, and, as such, move closer to a cognitive processing analysis of teaching similar to the analyses of human problem solving and decision making that have been conducted by cognitive psychologists (see, for example, Shulman & Elstein, 1975). Moreover, these results suggest that, in the future, researchers might construct a content x processes matrix of teachers' interactive thoughts. The content would reflect what the teacher is thinking about during interactive teaching (e.g., objectives, subject matter, instructional process, the learner, materials, or time) and the processes would reflect how the teacher is thinking about it (i.e., perceiving interpreting, anticipating, or reflecting).

All the categories in Table 5 reflect interactive thoughts that are directly related to the teacher's task of teaching. With the possible exception of the category "fantasy", none of the categories suggest that teachers' thoughts ever include off-task thoughts such as thoughts about what they are going to do after school or about their personal problems or personal life.[3] This is in distinct contrast to the content of students' reports of interactive thoughts during a stimulated-recall interview. When students are shown videotaped segments of themselves in a teaching-learning situation, they freely admit to and describe off-task interactive thoughts (see, for example, Peterson, Swing, Braverman, & Buss, 1982; Peterson, Swing, Stark & Waas, 1983).

Because it seems unlikely that teachers' interactive thoughts are always task relevant and likely that off-task thoughts would sometimes intrude, then the high frequency of task-relevant thoughts shown in Table 5 may be an artifact of the stimulated-recall procedures. If the teacher has control over stopping the videotape and talking about his/her interactive thoughts, then the teacher is likely to pick only those places where s/he is having task relevant interactive thoughts. Moreover, because the interviewers did not convey to the teachers that it was acceptable to have off-task thoughts, the demand characteristics of the situation may have been such that the teachers felt obliged to report only interactive thoughts that were on-task. Thus, teachers may have selectively recalled or reconstructed their reports of their interactive thoughts to reflect only task-relevant thinking.

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[3] Thanks to Gregory Waas for this observation.

Teachers' Interactive Decisions: Definition and Frequency

While some researchers have attempted to describe the content of teachers' interactive thoughts, other researchers have attempted to identify teachers' interactive decisions. The rationale for such a focus on teachers' interactive decision making is best summarized in the following statement by Shavelson (1973).

> Any teaching act is the result of a decision, whether conscious or unconscious, that the teacher makes after the complex cognitive processing of available information. This reasoning leads to the hypothesis that the basic teaching skill is decision making. (p. 18).

The above quote by Shavelson suggests that each action of the teacher is based on an interactive decision by the teacher. However, because of the obvious methodological problems involved in any attempt to probe the unconscious, most researchers have restricted their definitions and defined teachers' interactive decisions as a "conscious choice" by the teacher during classroom instruction. For example, Sutcliffe and Whitfield (1979) defined a decision as a conscious act that occurs when at least two alternatives are available--the choice to change behavior and the choice not to change behavior.

Similarly, Marland (1977) defined a decision as a conscious choice. However, Marland then used a more restrictive operational definition of an interactive decision. Marland coded a teacher's report of interactive thinking as an "interactive decision" only if it included all of the following: (a) explicit reference to consideration of alternatives, (b) evidence that the teacher made a selection and became committed to one of the alternatives, and (c) evidence that the teacher followed through in the lesson with his choice of alternatives. Marland's category of a "deliberate act" appears to more closely reflect a broader conception of an interactive decision as a conscious choice. Marland categorized a teacher's interactive thoughts as a "deliberate act" whenever a teacher saw the need for some action or response but considered only one course of action or whenever a teacher reported that he took a certain course of action and then stated the reason for doing so. Thus, by combining "deliberate acts" with Marland's category of "interactive decisions," we would argue that Marland and Sutcliffe and Whitfield appear to be in agreement on what constitutes an interactive decision: a teacher's conscious choice between continuing to behave as before or behaving in a different way.

Moreover, Morine and Vallance (1975), Fogarty, Wang, and Creek (1982), Wodlinger (1980), and Shroyer (1981) also agree with this definition. Morine and Vallance (1975) directed the teachers in their study to identify points on the videotape during the stimulated recall interview where the teacher remembered consciously saying to himself/herself, "Let's see, I think I'd better do this now," or "I guess I'll try doing this" (Morine & Vallance, 1975, p. 49). Fogarty et al. (1982) asked the teacher to stop the tape at any point where s/he recalled any thoughts or decisions.

Similarly, Wodlinger (1980) defined an interactive decision as consisting of statements or units in which the teacher's thoughts were focused upon the delivery of instructional material or student learning and in which the teacher mentioned the consideration of choice behavior as in the following:

> They weren't too sure yesterday, and they had problems with this stuff, so (I thought I would go back and ask those particular people, that were having problems yesterday.) So with Laura and Steve, you know, (I specifically asked them a question just to see if they were able to understand them from yesterday.) (Wodlinger, 1980, p. 282).

To be coded as an interactive decision, Wodlinger indicated that the teacher must have reported a deliberate choice to implement a specific new action.

Shroyer's (1981) category of "elective action" also fits into the above definition of teachers' interactive decisions. Shroyer first identified what she called "student occlusions." She defined a student occlusion as a student difficulty or unexpected student performance in the classroom. She then argued that when confronted with a student occlusion, a teacher elects to respond with some action. She further indicated that her term "elective action" was what she meant by a decision, but that she chose this term as an alternative to "decision" because "decision has traditionally implied the consideration of alternatives, a process for which research on interactive teacher thoughts has found little support" (Shroyer, 1981, p. 10).

These investigators have converged on a definition of an interactive decision as a deliberate choice to implement a specific action. Given this definition then, one can ask the question 'What is the frequency of teachers' reported interactive decisions?" Table 6 presents five studies that report results addressing this question. In spite of the variations in methodology employed in these five studies (see Table 4), the findings reported in Table 6 are remarkably consistent. Across the studies, the estimated number of interactive decisions made by teachers ranged from .5 to .7 per minute. The results of these studies are consistent in suggesting that, on the average, teachers make one interactive decision every two minutes. Thus, these data suggest that the decision-making demands of classroom teaching are relatively intense.

Teachers' Consideration of Alternative Courses of Action

The above results on the prevalence of teachers' interactive decisions are in sharp contrast to statements by others, such as MacKay and Marland (1978) and Lowyck (1980), who have indicated that teachers' interactive decision making during instruction does not occur as frequently as was expected. This discrepancy may be due to the fact that, originally, some researchers such as Peterson and Clark (1978) suggested that teachers' decision making during interactive teaching involved the teacher considering two or more alternative courses of action when s/he observed that the lesson was not going well. This conceptualization followed from Snow's (1972) description of teacher thinking during classroom instruction as a cyclical process of observation of student behavior, followed by a judgment of whether student behavior is within desirable limits, followed, in turn, by a

Table 6

An Analysis Across Five Studies of the Frequency of Teachers' Reported Interactive Decisions

Study	Category Name	Mean Frequency Per Lesson	Average Length of Lesson in Minutes	Estimated Number of Decisions (Acts) Per Minute	Range Across Teachers of Mean Decisions (Acts) Per Lesson	Range of Mean Decisions (Acts) Across Lessons and Teachers
Fogarty, Wang, & Creek (1982)	Interactive Decisions	8.4	15	0.56	4 to 11	____[a]
Morine & Vallance (1975)	Interactive Decisions	11.9	20	0.59	____[a]	____[a]
Marland (1977)	Total of Interactive Decisions and Deliberate Acts	28.3	60	0.47	10 to 36	6 to 43
Wodlinger (1980)	Interactive Decisions	24.1	35	0.69	____[b]	15 to 33
Shroyer (1981)	Elective Actions	22.2	45	0.49	6 to 36	____[a]

Note. [a] Information not provided in written report.

[b] N = 1 so no range can be computed.

decision to continue the teaching process unchanged or to search memory for alternative teaching behavior that might bring student behavior back within the limits of tolerance. If no alternatives were available in memory, the teacher would continue the classroom behavior as previously; if the search yielded a plausible alternative, the teacher might decide to act on that alternative by changing the course of instruction or might ignore the alternative and continue as before.

The Peterson and Clark model. Peterson and Clark (1978) presented a model of this sequence of events. This model of a teacher's decision processes during teaching is presented in Figure 2. In addition, Peterson and Clark (1978) identified four alternative paths through the model. These paths are summarized in Table 7. In Path 1, the teacher judges students' classroom behavior to be within tolerance. In other words, the teacher judges that the students are understanding the lesson and are participating appropriately. In Path 2, the teacher judges that the students' classroom behavior is not within tolerance. For example, the teacher may judge that the students either do not understand the lesson or perhaps are being inappropriately disruptive or withdrawn. However, the teacher has no alternative strategies or behavior in his/her behavioral repertoire. In Path 3, the teacher again judges that the students' behavior is not within tolerance, the teacher has alternative strategies or behaviors available in her/his teaching repertoire, but the teacher decides not to change teaching behavior to attempt to bring student behavior back within tolerance. Finally, in Path 4, the teacher judges that students' behavior is not within tolerance, that s/he does have alternative teaching strategies

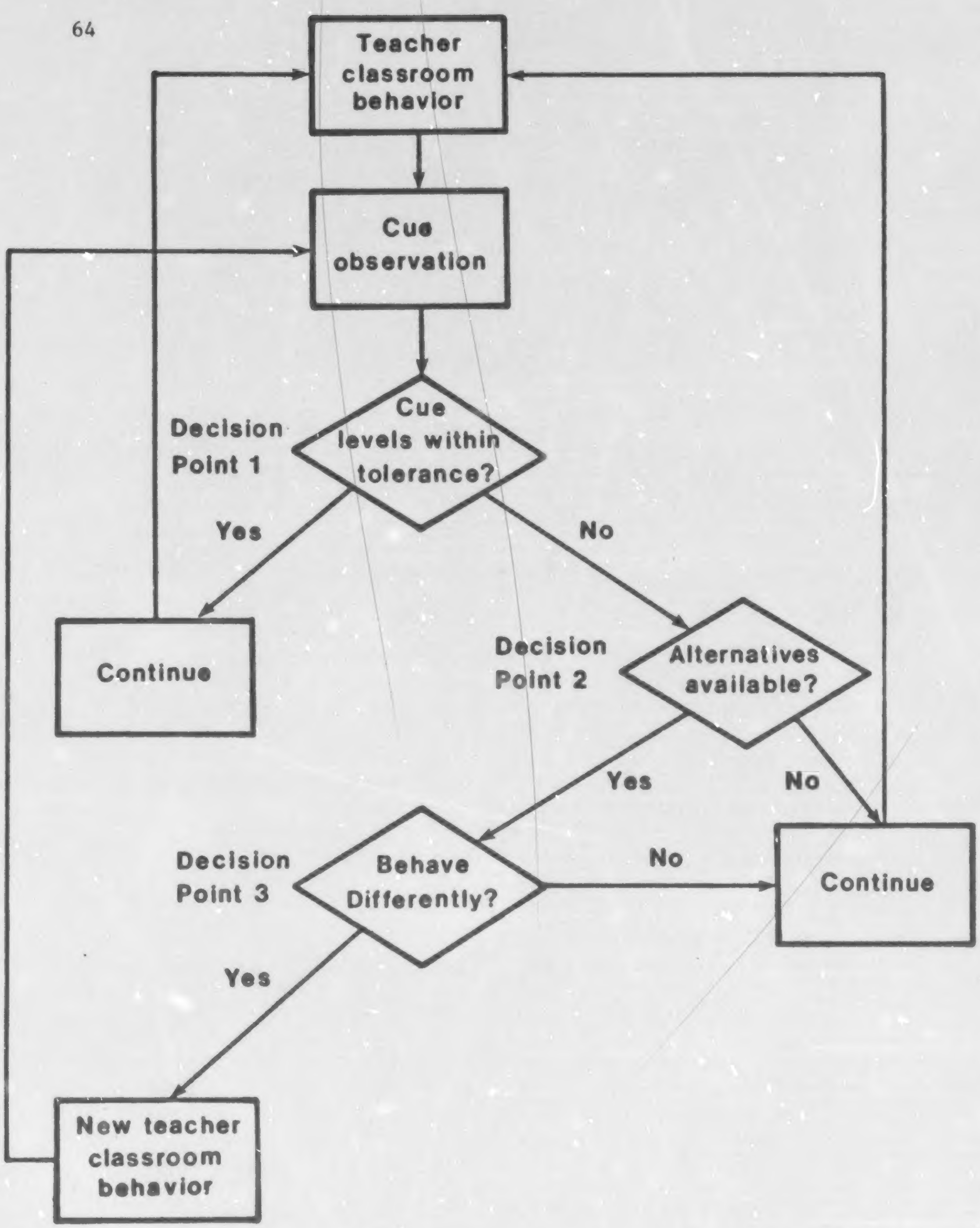
Teacher classroom behavior
Cue observation
Decision Point 1
Cue levels within tolerance?
Yes
No
Continue
Decision Point 2
Alternatives available?
Yes
No
Decision Point 3
Behave Differently?
No
Continue
Yes
New teacher classroom behavior

Figure 2. Peterson and Clark's (1978) model of teacher interactive decision making.

available, and decides to behave differently to bring student behavior back within the limits of tolerance.

Table 7

Four Alternative Paths for Teacher Information
Processing During Instruction
(from Peterson & Clark, 1978)

Decision Points	Path 1	Path 2	Path 3	Path 4
Student Behavior Within Tolerance	Yes	No	No	No
Alternatives Available?	-	No	Yes	Yes
Behave Differently?	-	-	No	Yes

Peterson and Clark (1978) categorized the reports of the cognitive processes of 12 teachers and found that the greatest majority of teachers' reports of their cognitive processes could be categorized as Path 1. The average frequency of Path 1 ranged from 71% to 61% across the three days of teaching. Peterson and Clark argued that because the cyclical repetition of Path 1 represented a teacher's report of conducting business as usual, it was not surprising that teachers' reports most frequently followed this path. As one teacher put it when he was asked if he were thinking of any alternative actions or strategies, "As this point? No. None at all. It was going along. The only time I think of alternative strategies is when something startling happens." (Peterson & Clark, 1978, p. 561).

Teachers reported considering alternative strategies in only 20% to 30% of the cases across the three days of instruction. This latter result is consistent with the findings of other investigators. For example, of the average of 28.3 interactive decisions and deliberate acts reported by the teachers in Marland's (1977) study, only 24% (6.8) of them involved the teacher's explicit reference to considering one or more alternatives and evidence that the teacher followed through with his choice of alternatives.

Some discrepancy exists between the findings of investigators who have attempted to determine how many alternative courses of action teachers tend to consider when they consider changing their behavior during interactive teaching. In their study of 18 second-grade teachers and 20 fifth-grade teachers, Morine and Vallance (1975) found that teachers considered an average of three alternative courses of action. Marland (1977) found that in the vast majority of interactive decisions, teachers reported considering only two alternatives. In a study of one teacher, Wodlinger (1980) found that the teacher considered only one course of action for the majority of her interactive decisions.

The above data on the relative infrequency with which teachers consider alternative courses of action during interactive teaching and the above results, which suggest that when teachers do consider alternative courses of action they do not consider many alternatives, suggest that the model proposed by Peterson and Clark (1978) may not be an accurate reflection of the decision-making processes that teachers engage in during interactive teaching. Shavelson and Stern (1981) proposed an alternative model that was based on the work of Joyce (1978-79), Peterson and Clark (1978), Shavelson (1976), and Snow (1972). This model is shown in Figure 3.

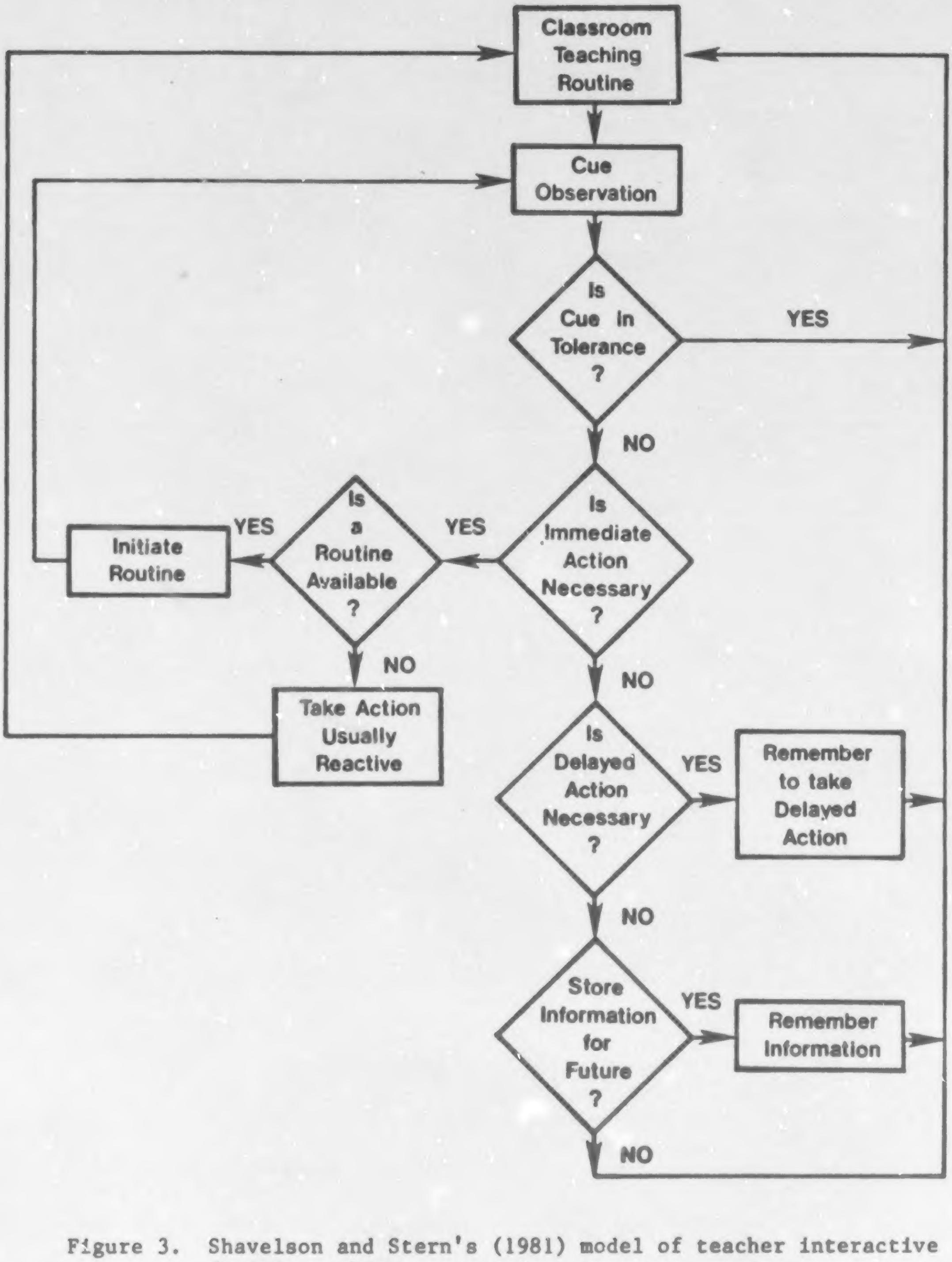
Classroom Teaching Routine
Cue Observation
Is Cue in Tolerance ?
YES
NO
Is Immediate Action Necessary ?
YES
Is a Routine Available ?
YES
Initiate Routine
NO
Take Action Usually Reactive
NO
Is Delayed Action Necessary ?
YES
Remember to take Delayed Action
NO
Store Information for Future ?
YES
Remember Information
NO

Figure 3. Shavelson and Stern's (1981) model of teacher interactive decision making.

The Shavelson and Stern model. Shavelson and Stern (1981) based their model on the assumption that teachers' interactive teaching may be characterized as carrying out well-established routines. Research on teacher planning suggests that teachers form a mental image that is activated from memory as a plan for carrying out interactive teaching. (See the section on teacher planning for a further discussion of this research.) Shavelson and Stern argue that,

> These images or plans are routinized so that once begun, they typically are played out, much as a computer subroutine is. Routines minimize conscious decision making during interactive teaching and so "activity flow" is maintained. Moreover, from an information-processing perspective, the routinization of behavior makes sense. Routines reduce the information-processing load on the teacher by making the timing and sequencing of activities and students' behavior predictable within an activity flow. (Shavelson & Stern, 1981, p. 482)

Indeed, the idea that during interactive teaching, teachers follow routines did not originate with Shavelson and Stern, but has been suggested by several researchers, including Yinger (1977), Morine-Dershimer, (1978-1979), and Joyce (1978-79). Shavelson and Stern's (1981) unique contribution is in presenting a model in which decision making during interactive teaching is portrayed as occurring when the teaching routine is interrupted (see Figure 3). As in the Peterson and Clark (1978) model, the teacher's decision making process involves the observation of cues and the determination of whether the cues (student behaviors) are within tolerance. However, Shavelson and Stern propose that if student behavior is not within tolerance, the teacher then decides whether immediate action is necessary. If immediate action is necessary, the teacher then decides whether an alternative routine is available and, if so, to initiate that routine; whether delayed action may be used rather than immediate action; or whether to continue the classroom teaching routine as before.

An advantage of the Shavelson and Stern model is that it incorporates the idea of "routine" as an important concept to explain teachers' interactive teaching behavior and decision making, and it incorporates the finding that teachers, for the most part, do not consider a large number of alternative courses of action (they may consider only one alternative teaching routine). But the Shavelson and Stern (1981) model, like the Peterson and Clark (1978) model, still assumes that the only antecedent for the teacher's interactive decision is observation of student cues and the judgment that the students' behavior is not within tolerance. We turn now to the work of researchers who have investigated the antecedents of teachers' interactive decision making and examined the extent to which observation of student cues serves as the antecedent of teachers' interactive decision making.

Antecedents of Teachers' Interactive Decisions

Marland (1977) investigated the antecedents of teachers' reported interactive decisions. He found that 44% of teachers' reported interactive decisions and deliberate acts occurred in response to a judgment by the teacher that the students' behavior was not within tolerance. These indications were (a) student deviance, noise, restlessness, inattentiveness, or disruption (antecedents of 20% of teachers' reported interactive decisions and deliberate acts); (b) incorrect, unsatisfactory, delayed, or incomplete student response or work (antecedents of 19.5% of teachers' reported interactive decisions and deliberate acts); and (c) students' apparent lack of understanding (antecedents of 3% of teachers' reported interactive decisions and deliberate acts).

For the purposes of this discussion, the most important point is that Marland found that the majority of teachers' reported interactive decisions occurred not in response to an observation by the teacher that student behavior was not within tolerance but rather occurred in response to other factors. Teachers reported making interactive decisions in response to a student question or a student-created contact with the teacher (19% of the reported interactive decisions); when identification of a respondent, participant, or student to be helped was needed (10% of the decisions); when there was a transition point in the lesson from one activity to another (8% of the decisions); when the teacher anticipated a problem or a difficulty (2% of the decisions); and in response to other miscellaneous factors, including insufficient time left in the lesson (5% of the decisions), shortage of materials (4% of the decisions) and late arrival of aides (1% of the decisions). In addition, Marland found that the majority of teachers' reported deliberate acts did not occur in response to student behavior but in response to other factors. A large percentage of teachers' reported deliberate acts (29%) involved the teacher's selection of a student respondent or participant, selection of a specific teaching technique, or selection of appropriate examples in content. Also, a number of deliberate acts occurred in response to a student initiated comment, question, or contact (11%).

In his study of a single teacher, Wodlinger (1980) also found that 51% of the teacher's reported interactive decisions had antecedents that originated with the teacher or the environment rather than with the student. Wodlinger reported that 16% of the teacher's reported interactive decisions originated with the teacher's cognitive state or affective state. This occurred when the teacher's thoughts or feelings were the stimuli for the formulation of an interactive decision. The following excerpt from a stimulated recall protocol illustrates this category of interactive decisions:

> I was mad. I was very cross, because, um, Michael had lost his math book and . . . and I was trying to decide what I was going to do about it, ah, at that point. I thought of some alternatives and thought,"Well, this isn't the time to deal with it," so I sort of left it. (Wodlinger, 1980, p. 116)

In addition, the environment, including time constraints, interruption by another adult, and instructional materials and equipment, served as antecedents for 35% of the teacher's reported interactive decisions. The antecedents for the remaining reported interactive decisions (49%) did involve observation of student cues, including the teacher's assessments and estimates of student behavior, student cognition, student affect, and other student characteristics, as well as the teacher's judgment of the lesson's progress and the lesson strategies that she was employing.

Similarly, Fogarty et al. (1982) found that although cues from students served as antecedents for the majority of teachers' reported interactive decisions (64%), non-student cues served as antecedents for a large part of them. Finally, although Housner and Griffey (1983) found that teachers' observations of student behavior served as antecedents of 85% of teachers' reported interactive decisions, this uncharacteristically high percentage probably reflects the fact that the stimulated-recall interview included a specific question on whether teachers' observations of student behavior caused the teacher to behave differently than s/he had planned.

The results of a policy-capturing study by Shavelson, Atwood and Borko (1977) also support the conclusion that factors other than teachers' judgments about students may serve as antecedents for teachers' interactive decisions. Shavelson et al. presented 164 graduate students in education (about two-thirds of them teachers) with a description of a fictitious student named Michael. Sixteen different stories were constructed about Michael and presented to the subjects. These stories contained initial and additional information about Michael that varied in valence (Michael was portrayed as high or low in ability and effort) and in terms of reliability (the information was presented so that one could infer it was either reliable or unreliable). Each subject read only one description of Michael. After reading the description, the subject was asked to make one simulated pre-instructional decision and two simulated interactive decisions. The results indicated that when subjects were asked to make an interactive decision that consisted of deciding what they would do if the student failed to answer a question during a mathematics lesson, the subjects considered the information about the student and the ability estimate irrelevant to their interactive decision. A similar picture emerged when the subjects were asked to make an interactive decision about reinforcement strategies for Michael. Again, the information about the student presented in the scenario had little effect on the subjects' reported interactive decision. The authors concluded that subjects' interactive decisions depended on information that was not measured in this experiment.

Although the findings from the Shavelson et al. study support the conclusion that factors other than teachers' judgments about students may contribute to teachers' interactive decisions, these results should be interpreted with caution. Subjects' responses to a questionnaire may not bear any resemblance to teachers' interactive decision making during an actual classroom situation. In addition, in simulations of this type, subjects are limited to the information provided (in this case, information on the ability and effort of Michael). By limiting the available student cues the researchers may have artificially restricted the natural variance in subjects' decisions (see for example, Clark, Yinger, & Wildfong, 1978, Yinger & Clark, 1983.) In addition, the antecedent of a teacher's interactive decision as postulated in the Peterson and Clark model is the teacher's observation of the student's behavior rather than the teacher's judgments of the student's states of mind (characteristics such as ability and effort), which were the antecedents that were varied in the Shavelson et al. study. Thus, perhaps if student behavior had been varied, then subjects' judgments of student behavior may have affected their reported interactive decisions. This hypothesis is supported by the results of a study by Cone (1978).

In a policy-capturing study in which 50 teachers were presented with a description of a fictitious student, Cone (1978) found that the type of deviant student behavior had a significant effect on the teachers' reported managerial decisions. Teachers selected more severe managerial strategies for student behavior that was more severe than for student behavior than was less severe (in order from most severe to less severe: physical aggression, speaking out, out of seat, and noise.) However, the way the student was characterized--as having a history of deviancy or as having no history of deviancy--also affected the teachers' reported managerial decisions. Teachers selected more severe managerial strategies for deviant students with a history of deviancy than for students with no history of deviancy. These results confirm that teachers' judgments of student behavior may be an important antecedent of teachers' interactive decisions. However, the question still remains as to why student characteristics were not importantly related to teachers' reported interactive decisions in the Shavelson et al. study, but were importantly related to teachers' interactive decisions in the Cone study.

A possible explanation is that students' behavior and characteristics are more importantly related to teachers' interactive decisions concerning classroom management than those concerning instruction. In his study of one teacher, Wodlinger (1980) found that students were the antecedents for more of teachers' reported interactive decisions dealing with classroom management (54%) than they were for teachers' interactive decisions dealing with instruction (46%). When Wodlinger examined the type of information the teacher used in making interactive decisions, he found that observed student behavior more frequently served as information the teacher used in making managerial decisions (34% of the time) than as information the teacher used in making instructional decisions (17% of the time).

Toward a New Model of Teacher Interactive Decision Making

Considering the above research findings, we would suggest that neither Peterson and Clark's (1978) nor Shavelson and Stern's (1981) models of interactive decision making are sufficient. Both models need to be revised to reflect two important points. First, a model of teacher interactive decision making should reflect the definition of interactive decision making as a deliberate choice to implement a specific action rather than a choice of actions from several possible alternatives. Second, a model of teacher interactive decision making should reflect the finding that the majority of teachers' reported interactive decisions are preceded by factors other than judgments made about the student. These factors might include judgments about the environment, the teacher's state of mind, or the appropriateness of a particular teaching strategy. Thus, while a large proportion of a teacher's interactive decisions do seem to occur as a result of a teacher's judgment about student behavior, a model that focuses only on student behavior as the antecedent of teacher interactive decisions (as do the Peterson and Clark (1978) and Shavelson and Stern (1981) models) does not accurately portray the processes involved in teacher interactive decision making.

Further specification of a model of teachers' interactive decision making requires research on the process whereby a given antecedent condition influences a teacher's interactive decisions. For example, in their models, Peterson and Clark (1978) and Shavelson and Stern (1981) assumed not only that student behavior was the only antecedent of teachers' interactive decisions, but that there is a threshold mechanism whereby student behavior affects teachers' interactive decisions. In other words, a teacher was assumed to make an interactive decision only when student behavior was judged by the teacher to be beyond a given threshold, at which point the teacher judged that student behavior was not within tolerance. Although in proposing their models, these researchers assumed a threshold mechanism whereby student behavior affected teacher interactive decision making, no research has been done to determine whether this is really the case. Research is needed to describe the process whereby a given antecedent condition results in an interactive decision by the teacher. Such studies might employ a process-tracing approach similar to the one used by Yinger (1977) in his study of a teacher's planning throughout a school year. Future models of teachers' interactive decision making also need to take into account the finding by Wodlinger (1980) that more than one antecedent often serves to stimulate the teacher's formulation of an interactive decision.

Specification of models of teacher interactive decision making by Peterson and Clark (1978) and Shavelson and Stern (1981) may have been premature. Calderhead (1981) suggested that such models may be overly constraining. Indeed, we now argue that these models may have led research on interactive decision making in the wrong direction because their originators assumed that student behavior was the only antecedent condition for teachers' interactive decisions and that teachers consider several possible alternatives, strategies, or courses of action when making an interactive decision. We would suggest, therefore, that before specifying a new model or revising the existing models of teacher interactive decision making, researchers should first do more descriptive research on how teachers make interactive decisions. Specification of a new model of teacher interactive decision making should await the findings from this research. Obviously, such an approach assumes a descriptive focus on teacher interactive decision making. At some point, researchers may want to be prescriptive. In other words, researchers may determine that more effective teachers are those who focus on student behavior as the primary antecedent condition for making an interactive decision. We turn now to the issue of teacher effectiveness and teacher interactive decision making.

Teacher Effectiveness and Teachers' Interactive Decision Making

Much research on teaching has been devoted to identifying the behaviors of effective teachers with the intent of using the findings to increase teachers' effectiveness (see, for example, Dunkin & Biddle, 1974; Peterson & Walberg, 1979; Brophy & Good, in press). Thus, one might ask the question, "What kinds of interactive decision making do effective teachers engage in?" or " What constitutes effective interactive decision making by a teacher?" Although, as we shall discuss, little empirical research has been directed toward answering these questions, several researchers have attempted to conceptualize the interactive decision making of an effective teacher.

Doyle (1979) described an idealized strategy for a teacher's information processing. He suggested that at the beginning of the school year, the effective teacher consciously directs attention toward gathering information about a particular classroom group (e.g., the steering group). To gather this information, the teacher implements a limited number of activities that have become automatized or routinized for the teacher. Given the routinized nature of these activities, the teacher can then direct her/his conscious processing of classroom events toward observing and monitoring behavior task initiations by students (e.g., off-task behavior or misbehavior by students). As the students learn the classroom routines, the teacher can introduce more activities that then, in turn, become routinized. Concurrently, the teacher's conscious processing becomes fine tuned and efficient. Eventually, all regular activities will be routinized, including administrative operations, recurring lessons, and even instructional moves. The teacher's conscious processing will then be available for specialized purposes such as scanning the room periodically, monitoring particular students or groups of students in the classroom, and solving problems in areas that cannot be routinized. As Doyle put it,

> In view of the frequency and the cost--in terms of reaction time and consequences--of unexpected events, it would seem adaptive and efficient for a teacher to direct conscious processing primarily to discrepancies or anomalies. By specializing in discrepancies, a teacher can anticipate disruptions and reduce the effects of immediacy and unpredictability on task accomplishment. (Doyle, 1979, pp. 62-63)

A similar picture of effective information processing during interactive teaching has been presented by Joyce (1978-79) and Corno (1981). Corno, for example, argued that effective classroom teachers ought to be consciously engaged in information processing. Teachers should be attending to and observing students' faces, actions, behavior, and voices. They should "see, hear, and then organize and check their perceptions to pace and maintain the flow of instruction and help accomplish instructional objectives." (Corno, 1981, p. 369).

Empirical research on the relationship of teachers' interactive decision making to student on-task behavior and achievement. Only three empirical studies, Peterson and Clark (1978), Doyle (1977), and Morine and Vallance (1975), have attempted to describe the thought processes and decisions of effective teachers during interactive teaching. Peterson and Clark (1978) and Morine and Vallance (1975) used the criterion that has been used typically to define effective teachers, namely, students' scores on an achievement test. In contrast, Doyle (1977) used student classroom behavior as the criterion. He defined successful teachers as those who maintained high levels of student work involvement and low levels of disruptions in their classrooms.

The first study we will address is the one by Peterson and Clark (1978) described above. Peterson and Clark categorized teachers' reports of their cognitive processes during interactive teaching into one of four paths and then related teachers' scores on the paths to students' achievement scores (see Figure 2 and Table 7). One might argue that a more effective path for teacher information processing during instruction would be Path 4, and a less effective path for teacher information processing would be Path 3. In other words, one might hypothesize that when an effective teacher observes that student behavior during classroom interaction is not within tolerance, s/he first considers whether alternative teaching strategies or behaviors are available in his/her repertoire. If so, s/he then decides to behave differently and to engage in new classroom behavior to bring student behavior back within the level of tolerance. This information processing path (Path 4) appears to reflect the kind of processing that a successful classroom manager would engage in as indicated by Doyle (1979). Doyle suggested that the successful classroom manager recognizes behavior task initiations (e.g., classroom misbehavior) immediately and intervenes early. This early intervention has the advantage of neutralizing a student's misbehavior before his/her peers reward it or public consequences occur. In contrast, the teacher's failure to initiate action that would bring student behavior back within tolerance (Path 3) would constitute ineffective classroom management as described by Doyle and might be considered to constitute ineffective teaching.

In support of the latter conclusion, Peterson and Clark (1978) found that teachers' reported frequency of following Path 3 was significantly negatively related to students' achievement scores. Teachers whose reports of information processing during interactive teaching were most often categorized as Path 3 had students who achieved lower scores on a multiple choice achievement test ($r = -.50$, $p < .05$, one-tailed test) and on the factual content of an essay test ($r = -.64$, $p < .05$, one-tailed test). On the other hand, the frequencies with which teachers followed the other paths, (Path 1, Path 2, or Path 4,) were not significantly related to students' achievement scores.

Interestingly, Peterson and Clark (1978) also reported information about the planning of these same teachers. They found a significant positive correlation ($r = .51$, $p < .05$, one-tailed test) between teachers' planning statements about objectives and scores on Path 3. If a teacher reported having alternative teaching strategies in mind but did not report behaving differently, it may have been because the teacher saw himself/herself as pursuing an instructional objective that s/he had in mind as the result of planning. Thus, a teacher's reported decision not to behave differently may have been a logical one based on instructional objectives that the teacher had established during planning. This interpretation is consistent with the findings of a study by Zahorik (1970) in which teachers who had two weeks to prepare a lesson were rated as less flexible and more rigid than teachers who had had no opportunity to plan. However, even though the teachers' information processing may have had a logical basis, the present data still indicate that teachers who reported that student behavior was outside tolerance but who reported that they did not change their behavior tended to be less effective teachers--to have students who achieved less.

In the second study, Doyle (1977) observed 58 student teachers for the full duration of their student teaching assignments, which varied from 8 to 16 weeks. He observed each student teacher for one class period each week. He used an ecological approach in taking field notes and in writing classroom descriptions. The findings showed that, compared to unsuccessful teachers, successful teachers had the following cognitive skills: (a) rapid judgment, (b) chunking, and (c) differentiation. Successful teachers learned to make rapid judgments during interactive teaching. To simplify and deal with the demands created by the complex classroom environment, successful teachers used chunking, or the ability to group discrete events into larger units, and they differentiated or discriminated among units in terms of their immediate and long-term significance.

This definition of "differentiation" is what Corno (1981) referred to as "selectivity." Corno argued that effective teachers engage in the cognitive process of selectivity--separating out important from salient incidental information--during interactive teaching. Similarly, Doyle's categories of chunking and rapid judgment are included in Corno's category of "transformation." Transformation of information involves the processes of comparison, integration, rehearsal, and elaboration. In sum, then, the research findings from the study by Doyle (1977) confirm the portrayal of the effective teacher as one who engages actively in cognitive processing of information during teaching but who engages in specific kinds of processes, such as chunking and differentiation, which enable him/her to simplify and make sense of the complex classroom environment.

In support of this latter statement, Morine and Vallance (1975) found that less effective teachers mentioned specific aspects of their decisions more frequently and referred to more items of information used in making their decisions than did more effective teachers. In other words, less effective teachers reported having more things in mind as they discussed their interactive decisions during a stimulated-recall interview. (See Table 4 for a description of the study and the method.) In this study, more effective teachers were defined as those whose students had higher gain scores on an achievement test, and less effective teachers were defined as those whose students had lower gain scores on an achievement test. Thus, the definition of teacher effectiveness was the one that has been used typically in process-product studies of teaching effectiveness.

Morine and Vallance reported that, compared to teachers with high student achievement gains, teachers with low student achievement gain scores tended to mention a larger number of items that they were taking into account on almost all aspects of interactive decisions that they discussed. This finding might be interpreted to mean that less effective teachers were not engaging as frequently in the cognitive processes mentioned by Corno and Doyle such as chunking, differentiation, and selectivity, which would enable them to simplify the amount and kind of information that they were taking in during interactive teaching. Perhaps more effective teachers mentioned a smaller number of items because they had successfully "transformed the complexity of the environment into a conceptual system that enabled them to interpret discrete events and to anticipate the direction and flow of classroom activity" (Doyle, 1977, p.54). This conclusion is further substantiated by research comparing the interactive decision making of beginning and experienced teachers.

Studies of the interactive decision-making processes of beginning versus experienced teachers. Calderhead (1981) compared the comments of beginning and experienced teachers in response to descriptions of common classroom critical incidents. Calderhead presented the critical incident orally to the teacher (e.g., "The class is working quietly when a group of children start talking amongst themselves"). He then asked the teacher, "What more do you need to know to make up your mind what to do, and what would you do?" In analyzing experienced and beginning teachers' responses to this task, Calderhead found a marked difference in the nature and sophistication of their interpretations and understanding of classroom events. He found that beginning teachers seemed to either lack the conceptual structures to make sense of classroom events or to have simple undifferentiated structures. Moreover, beginning teachers did not seem to extract the same kind or level of meaning from the description of the critical incident as did experienced teachers.

In recent years, cognitive psychologists have used the word "schema" to describe the way knowledge is stored in memory. (See for example Anderson, 1977; Nisbett, & Ross, 1980; Rumelhart, 1980). As Nisbett and Ross (1980) put it:

> Peoples' generic knowledge also seems to be organized by a variety of . . . schematic, cognitive structures (for example, the knowledge underlying one's awareness of what happens in a restaurant, one's understanding of the Good Samaritan parable, or one's conception of what an introvert is like). To describe such knowledge structures, psychologists refer to a growing list of items, including "frames," . . . "scripts" . . . "nuclear scenes" . . . and "prototypes" . . . in addition to the earlier and more generic term "schemas" (Nisbett & Ross, 1980, p. 28).

Although Calderhead (1981) did not discuss his findings in terms of experienced teachers having different schemata from beginning teachers, we interpret his results to suggest that experienced teachers may have better developed knowledged structures or schemata for phenomena related to classroom learning and teaching than do novice teachers. Similarly, we infer from the findings of Doyle (1977) and Morine and Vallance (1975) that effective teachers may also have better developed schemata for classroom events than do ineffective teachers. Some relevant schemata for a teacher might include: (a) knowledge underlying his/her conception of what school children are like and (b) knowledge underlying his/her awareness of what happens in classrooms.

Interestingly, the findings from a study by Calderhead (1983) indicate that the schemata experienced teachers have for school children or students may differ significantly from the schemas that beginning teachers have for school children or students. Calderhead (1983) used interviews, the repertory grid technique, and stimulated recall to study the perceptions of six experienced teachers, six student teachers, and six teachers who were in their first year of teaching. He found that experienced teachers appeared to have amassed a large quantity of knowledge about children in general. As Calderhead put it, "experienced teachers in a sense 'know' their new class even before they meet them" (Calderhead, 1983, p. 5). Calderhead reported that experienced teachers knew the kinds of home background students had. They had an idea of the range of knowledge and skills to expect in their class and of the likely number of children who would need special help. They knew the types of misbehaviors and discipline problems that would occur. They knew the kinds of experiences that students tended to have had prior to school and the kinds of activities that the children engaged in outside of school.

Differences between experienced and novice teachers in another kind of schema--knowledge underlying their awareness of what happens in classrooms--may lead experienced and novice teachers to focus on different types of student cues in their interactive decision making. For example, Housner and Griffey (1983) found that while negative cues from students frequently resulted in both experienced and novice teachers' reported decisions to change their behavior (about 45% of the time), positive student cues resulted more often in experienced teachers' decisions to change their behavior than in novice teachers' decisions to change their behavior (30% and 6% of the time for experienced and novice teachers, respectively). With remarkable similarity, Fogarty et al. (1982) found that, of all the cues that led to their interactive decisions, novice teachers reported focusing on students' disruptive behavior most frequently (27% of the cues reported). In contrast, experienced teachers reported disruptive behavior infrequently in their reports of cues that led them to make interactive decisions (6% of the cues reported). These results suggest that experienced and novice teachers may differ considerably in their perceptions of classroom events as well as their underlying schemata for what constitutes an appropriate flow of classroom events.

Cognitive psychologists have argued that schemata affect perception, understanding, remembering, learning, and problem solving. One can well imagine that the experienced teacher would have better developed schemata as well as schemata more relevant to the teaching situation than would beginning teachers. Similarly, the schemata of effective teachers might differ significantly from the schemata of ineffective teachers. Presumably, having an appropriate schema for the conception of what a fourth-grade child is like as well as an appropriate schema for events and life in a fourth-grade classroom would be particularly important and useful if one were a fourth-grade teacher. Such schemata would obviously affect the teacher's perception of events during interactive teaching, affect the teacher's perception of the students, enhance the teacher's understanding of events that may occur during interactive teaching, and aid the teacher in problem solving and decision making during interactive teaching.

Training Teachers in Effective Interactive Decision Making

Peterson and Clark (1978), Doyle (1977), and Morine and Vallance (1975) investigated the relationship between variables related to teachers' interactive decision making and a criterion variable of effective teaching, such as student achievement or students' on-task behavior in class. Similarly, Calderhead's (1981; 1983) studies were descriptive. Thus these studies fall within the correlational part of the correlation-experimental loop that has served as the basis for classroom research following the process-product paradigm (Rosenshine & Furst, 1973). The purpose of correlational research is to identify teaching behaviors that can then be manipulated or taught in experimental studies to determine if training teachers to engage in these "effective" behaviors leads to an increase in student achievement.

Unfortunately, no experimental studies have been undertaken in which researchers have attempted to train teachers in interactive decision making skills and then to systematically evaluate the effects of such training on students' achievement. Although some researchers have attempted to train teachers in effective decision making skills, these researchers have not systematically evaluated the effects of training on students' achievement. For example, Bishop and Whitfield (1972) created "critical incidents" to serve as simulation exercises for preservice teachers to practice interactive decision making. They proposed that preservice teachers should read the critical incident and then be encouraged to develop decision-making skills by asking themselves the following questions: (a) What is the cause of the critical incident? (b) What decision areas are involved in the critical incident (e.g. cognitive learning, affective learning, pupil-teacher relationships, teacher-adult relationships, apparatus and aides, organization and administration)? (c) What criteria should be applied in making the decision? (d) What options are available? (e) Do I have enough information? (f) What is my decision? and (g) How would I evaluate my decision? Although the above model for training teachers in interactive decision making was proposed by Bishop and Whitfield in 1972, Sutcliffe and Whitfield (1979) noted that the technique had yet to be applied widely and evaluated systematically in teacher training. However, Sutcliffe and Whitfield argued that educators should train teachers in interactive decision making and, concurrently, evaluate the effects of training on teacher effectiveness, including the effects of training on student achievement gains.

Although we would agree that, eventually, researchers should conduct such experimental studies, we would argue that training teachers in a particular model of interactive decision making is premature. From the correlational research, we have gleaned the notion that ineffective teachers' interactive decision making *may* involve: (a) the teacher cognitively processing too great a variety and quantity of information during the ongoing classroom interaction without simplifying the information, through processes such as chunking and differentiation, so that the information can be used effectively in interactive decision making and (b) a teacher's decision not to change behavior even when student behavior is judged to be unacceptable, even though the teacher believes that s/he has alternative strategies or behavior available that could change student behavior.

We do not have a clear idea, however, of what constitutes *effective* interactive decision making by a teacher. The teachers who in the Peterson and Clark (1978) study reported following the path which, on the face of it, would appear to be the most appropriate and effective for interactive decision making, were not significantly more or less effective than teachers who did not report following this path. On the other hand, if we can believe the findings regarding effective teachers as being better at simplifying, differentiating, and transforming the information perceived during classroom interaction, then perhaps researchers should focus their experimental research not on training teachers in interactive decision making but on training teachers to perceive, analyze, and transform their perceptions of the classroom in ways similar to those used by effective teachers.

Teachers' Theories and Beliefs

Nisbett and Ross (1980) have suggested "that people's understanding of the rapid flow of continuing social events" often depends on their "rich store of general knowledge of objects, people, events, and their characteristic relationship" (p. 28). Nisbett and Ross indicated further that some of this knowledge is organized in schematic, cognitive structures while other knowledge is represented as beliefs or theories, "that is, reasonably explicit 'propositions' about the characteristics of objects or object classes" (p. 28).

As a person whose daily task is to understand and interpret the rapid flow of social events in a classroom, the teacher obviously relies on these same kinds of knowledge structures that have been described by Nisbett and Ross (1980). We have already described how the first kind of knowledge structures or schemata may affect teachers' information processing and behavior during planning and during classroom interaction. In this section we will discuss the second kind of knowledge, propositional knowledge, which is represented as teachers' theories or beliefs.

Teachers' Theories and Beliefs About Students: Teachers' Attributions for the Causes of a Student's Performance

Psychologists have argued that the theories with the most significant and far reaching consequences are those that focus on the general causes of human behavior (see, for example, Heider, 1958;

Weiner, 1974; and Nisbett & Ross, 1980). Similarly, in considering teachers' theories and beliefs about students, some researchers have suggested that the most important beliefs teachers have about students are those that deal with teachers' perceptions of the causes of students' behavior or, in other words, teachers' attributions for the causes of students' performance (see, for example, Darley & Fazio, 1980; Peterson & Barger, in press). Indeed, Darley and Fazio (1980) and Peterson and Barger, (in press) have suggested that teachers' attributions for the causes of students' performance may be important in attempting to understand how teacher expectancies affect student achievement in the classroom. For these reasons, in our discussion of teachers' theories and beliefs about the student, we will focus on teachers' attributions.

Although the research literature on teachers' attributions is large, we will confine our review to research that addresses four major questions: (a) How have researchers conceptualized teachers' attributions for the causes of students' successes and failures? (b) What factors affect teachers' attributions for the causes of students' performance? (c) What is the relationship between teachers' attributions for the causes of students' peformance and teachers' behavior toward these students in the classroom? and (d) What is the relationship between teachers' attributions for the causes of students' performance, teachers' planning and interactive decision making, and students' achievement? (See Peterson & Barger, in press, for a more complete discussion of the research on teachers' attributions.)

How researchers have conceptualized teachers' attributions for the causes of students' performance. Researchers have differed significantly in the category systems they have used to describe teachers' attributions for the causes of students' performance. Table 8 presents four alternative category systems that have been used to describe and categorize attributions. Weiner, Frieze, Kukla, Reed, Rest, and Rosenbaum (1971), Frieze (1976) and Bar-Tal and Darom (1979) developed their categories originally to describe students' attributions for the causes of their performance. However, these categories have been used subsequently by other researchers to describe teachers' attribution. In contrast, Cooper and Burger (1980) developed their categories using teachers rather than students as respondents, and they developed the categories explicitly to describe teachers' attributions for the causes of students' performance.

The four category systems in Table 8 also differ to the extent that they were generated by the investigator a priori or in an attempt to categorize attributions provided by subjects in a free-response situation. Weiner et al. (1971) suggested that their experimenter-generated categories were the most common and general of the perceived causes for successes and failures. Frieze (1976) asked 51 college students to explain their own and others' successes and failures on academic and non-academic tasks. She derived her coding scheme from the college students' open-ended responses. Bar-Tal and Darom (1979) asked 63 fifth-grade students to provide explanations for the grade that they had just received on a test. The researchers then categorized the students' attributions for the causes of their peformance into the eight categories shown in Table 8. Cooper and Burger (1980) asked 39

Table 8

A Summary of Categories Used by Researchers to Describe Students' and Teachers' Attributions for the Causes of Students' Successes and Failures
(adapted from Cooper and Burger, 1980)

Weiner et al.'s (1971) Categories	Frieze's (1976) Categories	Bar-Tal & Darom's (1979) Categories	Cooper & Burger's (1980) Categories
Ability	Ability	Ability	Ability (academic, physical, or emotional)
Effort	Stable Effort	Effort During Test	Previous Experience
Task Difficulty	Immediate Effort	Preparation at Home	Acquired Characteristics (habits, attitudes, self-perceptions)
Luck	Task	Interest in the Subject Matter	Typical Effort
	Other Person	Difficulty of Test	Interest in the Subject Matter
	Mood	Difficulty of Material	Immediate Effort
	Luck	Conditions in the Home	Attention
	Other	Teacher	Teacher (quality and kind of instruction, directions)
			Task
			Other Students
			Family
			Physiological Processes (mood, maturity, health)

elementary and secondary teachers to list three students in their class that they expected to do well academically and three that they expected to do poorly. They then asked the teachers to list why the outcome was predicted for each student. Cooper and Burger derived their categories from the teachers' free responses.

Most researchers on teachers' attributions have tended to use some subset of the categories presented in Table 8 or some paraphrasing or adaptation of these categories. In addition, researchers have been concerned with some larger more encompassing dimensions of attributions such as whether the attribution is to a cause internal to the student (e.g., effort or ability) or external to the student (e.g., luck, task difficulty, or the teacher) and whether the attribution is to a stable cause (e.g., ability, task difficulty, or typical effort) or to an unstable cause (e.g., luck or immediate effort). Furthermore, as we shall show, researchers have been concerned with whether teachers tend to attribute students' successes and failures to themselves (i.e., the teacher) and thereby take responsibility for students' performance or whether they tend to attribute students' performance to factors other than the teacher (e.g., students' effort, ability), thereby eschewing responsibility for the students' performance. An implicit assumption of researchers has been that if teachers fail to accept responsibility for students' successes or failures and thus fail to see a relationship between their behavior and students' performance, they would be less likely to work to improve their students' performance in the classroom. Thus researchers have been concerned with factors that affect teachers' attributions and, in particular, the extent to which teachers accept responsibility for students' successes or failures.

Factors that affect teachers' attributions: The self-serving bias. Attribution theorists have hypothesized that a person's causal attributions will be affected by whether the person is an actor in the situation (i.e., one of the participants in the social interaction) or an observer (i.e., an onlooker who is uninvolved in the social interaction) (see, for example, Jones & Nisbett, 1971). Because teachers are active participants in the classroom interaction process that leads to students' successes and failures, teachers' attributions for student performance might be affected or biased systematically by their role as an actor rather than as an observer. The teacher's role as an actor may lead to two different patterns of attributions: (a) ego-enhancing or (b) counter-defensive. Ego-enhancing or self-serving attributions occur when, as a result of being a participant in the social interaction, teachers attribute a student's successful performance to themselves as teachers and a student's failure to factors other than the teacher. Teachers thereby enhance their egos by accepting responsibility for students' successes while blaming the students for their failures. In contrast, counter-defensive attributions occur when the teacher accepts responsibility for students' failures and gives credit to the students themselves for successes.

Research findings have been inconsistent in indicating the extent to which being an actor in the situation leads the teacher to form ego-enhancing attributions for the student's performance. Table 9 presents the findings from this research. Four studies have found that being an actor in the situation leads the teacher to form ego-enhancing attributions (Johnson, Feigenbaum, & Weiby, 1964; Beckman, 1970; Brandt, Hayden, & Brophy 1975; and Wiley & Eskilson, 1978). In contrast, three

Table 9

Studies Investigation the "Self-Serving" Bias in Teachers' Attributions (Ego-Enhancing Attributions)

Study	Subjects	Task	Results
Ames (1975)	Undergraduate students in educational psychology.	Teaching a concept classification task to a 10-year old male Confederate in one 15-minute session.	"Teachers" attributed student's failure significantly more often to themselves than to the student or the situation; they attributed student's successes significantly more often to the student himself. (Non-defensive attribution.)
Beckman (1970)	Preservice teachers were the "teachers"; undergraduate psychology students were the "observers."	Teaching mathematics to two fictitious elementary school children.	"Teachers" attributed a student's successful performance to themselves as teachers and a student's failure to factors other than teacher (i.e., characteristics of student or the situation). (Ego-enhancing attributions.) "Observers" attributions were not affected by student performance.
Beckman (1973)	Preservice and inservice teachers assigned randomly to be either "teacher" or "observer."	Teaching mathematics to a fictitious fifth-grade student.	"Teachers" attributed any change in student's performance to themselves (i.e., (counter-defensive attributions) more often than did "observers."
Beckman (1976)	48 parents and 9 teachers of 4th, 5th, & 6th grade students (40% were from minority groups).	Teachers gave attributions for high, medium, & low performing students in their classes; each parent rated his/her child on attributions for performance.	On open-ended questions, parents of successful students were more likely to mention teaching than teachers. (Teachers never mentioned teaching as a factor on open-ended questions.) On structured questions, parents attributed performance at all levels to teacher factors as often as to child factors (ability & effort), while teachers attributed performance more often to child factors than to their own teaching.
Brandt, Hayden, & Brophy (1975)	Undergraduate students in introductory psychology.	Teaching government to a fictitious fourth-grade student in four 4-minute lectures.	"Teachers" who taught successful students assigned more responsibility to themselves (rather than to the student) than did teachers who taught unsuccessful students. (Ego-enhancing or self-serving attributions.)
Johnson, Feigenbaum & Wilby (1964)	Preservice teachers enrolled in ed psych course.	Teaching mathematics to two fictitious fourth-grade boys.	Teachers attributed an improvement in the student's performance to themselves as teachers; they attributed a lack of improvement to the student himself. (Ego-enhancing attributions.)
Ross, Bierbrauer & Polly (1974)	Preservice and inservice teachers were "teachers"; undergraduates were "teachers" or "observers."	Teaching spelling to a sixth-grade Confederate of the experimenter.	"Teachers" attributed student's failure more often to themselves than to student himself and attributed student's success more often to the student than to the teacher; this effect was more pronounced for actual teachers than for undergraduate "teachers." (Non-defensive attributions.) Undergraduate "observers" and "teachers" did not differ significantly in their attributions.
Tetlock (1980)	Undergraduate students in Introductory Psychology served as "observers."	Read simulated materials from the Ross et al., study (including teachers' attributions which were varied systematically) and rated the teachers.	Hypothesis was that teachers' counter-defensive (non-defensive) attributions are "self presentations" designed to create favorable impressions in others. Consistent with this hypothesis, observers rated moderately counter-defensive teachers (those in the Ross study) as significantly more competent than the moderately or highly defensive (Ego-enhancing) teacher.
Wiley & Eskilson (1978)	128 elementary school teachers.	Completed questionnaire after reviewing the file of a fictitious student who varied in sex, race, and past performance.	Teachers were rated as playing a more important role in successful performance of a student than in unsuccessful performance. (Ego-enhancing attributions.)

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studies found support for a counter-defensive bias in teachers' attributions (Beckman, 1973; Ross, Bierbrauer, & Polly, 1974; and Ames, 1975). Peterson and Barger, (in press) suggested that the results of these seven studies are not necessarily inconsistent and may be interpreted as indicating that teachers are less likely to make ego-enhancing attributions in more naturalistic situations. They argued that in contrast to the previous experimental studies by Johnson et al. (1964) Beckman (1970; 1973) Ross et al. (1974), and Ames (1975) were more ecologically valid because the researchers employed an actual student confederate and permitted the "teacher" to interact during teaching with the "student." The findings of these latter two studies imply that in actual classroom settings, teachers would be more likely to make counter-defensive than ego-enhancing attributions for the causes of students' performance.

Why might teachers in an actual classroom setting be more likely to make counter-defensive than self-serving attributions? Tetlock's (1980) results support the hypothesis that teachers' counter-defensive attributions are "self presentations" designed to create favorable impressions in others (see Table 9). In an actual classroom setting, teachers would be likely to be concerned about the impressions that they are making on persons that they come into contact with on a daily and regular basis, including students, parents, fellow teachers, and the principal. Thus, teachers would tend to make counter-defensive attributions to enhance their perceived competence. In the end, teachers' counter-defensive attributions may also be self-serving.

As an extension of this argument, Peterson and Barger (in press) proposed that in a naturalistic classroom setting teachers might even show a humility bias in their attributions. In the only study to date in which teachers' attributions for the cause of the performance of actual students in their own classroom were compared with parents' attributions for the same children, Beckman (1976) found that, on open-ended questions, teachers never mentioned teaching or the teacher as a factor determining a student's performance (see Table 9). Perhaps in a situation in which teachers know their students well and in which they are concerned about creating a favorable impression (in this case, with the experimenters who would read their responses and the parents of the students who also provided attributions for the cause of their child's performance), teachers may not take credit for their students' performance because they do not want to appear arrogant. A desire to create a favorable impression my have lead to a humility bias in teachers' attributions.

Ames (1982) proposed an alternative explanation for the inconsistent findings regarding the self-serving bias in teachers' attributions: that teachers' attributions are affected by an additional factor--teachers' "value for responsibility." He hypothesized that a teacher's value for responsibility involves three key beliefs: (a) that teaching is an important activity, (b) that teachers engage in intentional acts to produce positive outcomes, and (c) that students' success is generally feasible given the situation and constraints. Ames predicted that high-value teachers would take responsibility for their own actions and for the performance of their students (i.e., attribute students' performance of their own effectiveness to themselves). In contrast, Ames predicted that low-value teachers would attribute student performance to the student himself/herself or to situational factors. Ames did note one exception. He hypothesized that high-value teachers would attribute a successful student performance to the student because this attribution was logically consistent with the belief that good teachers reinforce their students for success to encourage the students to work hard.

Although Ames's (1982) hypotheses are appealing intuitively, little research has been done to test whether teachers' value for responsibility does indeed affect teachers' attributions. Ames (1982) reported the results of two studies that supported the hypothesized relationship between teachers' value for responsibility and teachers' attributions. However, in both these studies the findings were based on questionnaire responses from college instructors, and the obtained response rate was extremely low in both studies (39% in the first study and 31% in the second study). Because of this low response rate, the results may not be representative; in particular, the results may be biased if, in fact, only those instructors who placed a high value on teaching (the topic of the questionnaire) were the ones who returned their questionnaires. Thus, although Ames' results are provocative, more research is needed that explores the relationship between the value that teachers place on teaching and their attributions for students' performance in the classroom.

Other factors that affect teachers' attributions. In addition to the teacher's role in the classroom interaction, researchers have hypothesized that other factors also affect teachers' attributions for the causes of students' performance. These factors include the teacher's perception of the student's past performance as well as the student's characteristics, including race, social class, and sex.

Peterson and Barger (in press) concluded that research findings show that teachers use information about a student's past performance in making attributions about the causes of the student's present performance so as to maintain a consistent picture. Teachers are likely to attribute an expected outcome, such as success by a student perceived as high in ability, to a stable factor such as ability. On the other hand, teachers are likely to attribute an unexpected outcome, such as success by a student perceived as low in ability to an unstable factor such as luck. One insidious outcome of this impression-maintenance attribution bias is that even if a student works hard to dispel a teacher's misconception of his/her lack of ability, the student might not receive full credit from the teacher for his/her actions.

The effects of race and social class on teachers' attributions are less clear. Researchers have hypothesized that teachers perceive that black students have less control over their successes and failures than white students and that black students' failures are due to bad luck rather than lack of ability. Findings by Wiley and Eskilson (1978) supported this hypothesis. Cooper, Baron, and Lowe (1975) showed that the effect of race on teachers' attributions was mediated by students' social class. In addition, Domingo-Llacuna (1976) and Feuquay (1979) found that the effects of race and social class were more complex when teachers' internal and external attributions for students of different races were broken down into specific attributions, such as ability, effort, and luck for the causes of students' successes and failures.

In contrast to the findings for race and social class, sex of student has not been shown to be a significant factor affecting teachers' attributions. For example, Wiley and Eskilson (1978) found that sex of the stimulus student in a description provided to teachers had no significant effect on the causal attributions that teachers made for student performance. Similar non-significant effects of sex were reported by Hanes (1979). On the other hand, Dweck, Davidson, Nelson, and Enna (1978) reported significant sex differences in the attributional statements that teachers made to girls and boys in their classrooms. Teachers were more likely to make statements attributing failure to a lack of effort for boys than for girls. However, studies by Blumenfeld, Hamilton, Wessels and Falkner (1977) and Heller and Parsons (1981) have failed to replicate the Dweck et al. (1978) findings.

The relationship between teachers' attributions and teachers' behavior. Attribution theorists have stated that a significant relationship exists between a teacher's attributions for the causes of a student's performance and the feedback that the teacher gives to the student. In an initial study, Weiner and Kukla (1970) found that the greater the student's success, the more positive the teacher's feedback. Students who were perceived by the teacher as expending effort were rewarded more and punished less than students who were perceived as not trying. Perceived effort was a far more important determinant of reward and punishment than perceived ability.

Most research on the relationship between teachers' attributions and their behavior has tended to support the conclusion that teachers' attributions to effort are highly predictive of the teachers' feedback to the student. Research in support of this conclusion includes studies by Silverstein (1978), Medway (1979), Meyer (1979), Cooper and Burger (1980), and Covington, Spratt, and Omelich (1980). The only contrary evidence has been reported by Cooper and Baron (1977; 1979). Table 10 summarizes the results of the studies. Peterson and Barger (in press) concluded that the majority of the evidence suggests that students who are perceived by teachers as expending effort (i.e., teachers attribute their performance to effort) are rewarded more and punished less by teachers than students who are perceived as not really trying (see Peterson and Barger, in press, for a more complete discussion of the results). They also suggested that teachers' affect or emotion may serve as a mediator between teachers' attributions and behavior. In support of this position, Prawat, Byers and Anderson (1983) found that teachers were angry when they perceived that a student had failed due to lack of effort.

Although the majority of the research has examined the relationship between teachers' attributions and teacher feedback, two studies have explored the possibility that teachers' attributions may affect other kinds of teacher behavior. The results of a study by King (1980) suggest that teachers' attributions for the causes of a students' performance may affect the number and kind of interactions the teacher has with the student (see Table 10). Brophy and Rohrkemper (1981) reported that teacher attributions for a student's performance affected the types of goals the teacher set for the student, the way in which the teacher controlled and managed the student's behavior, and the type of educational practices that the teacher used with the student. While these latter findings are suggestive rather than conclusive, they do

Table 10

Studies on the Relationship Between Teachers' Attributions and Teacher Behavior

Study	Subjects	Task	Results
Cooper & Baron (1977)	8 elementary teachers.	Nine target students were selected for whom the teachers had high, medium or low expectations, respectively. Teachers were asked to assign responsibility for each student's performance to (a) personal or (b) environmental factors. Target student-teacher behavior was observed.	Perceived responsibility for success did not predict teacher praise; perceived responsibility for failure did not predict teacher criticism. As perceived responsibility for success increased, number of negative behavior interactions decreased and frequency of child-created interactions decreased; as perceived responsibility failure increased so did child-created procedural interactions. Performance expectations were more potent predicters of teachers' feedback than were teachers' attributions.
Cooper & Baron (1979)		Response to Meyer (1979)	(a) Effort & ability are not orthogonal in real life, they covary; (b) laboratory studies such as those done by Meyer & attribution theorists show different results than those using face to face interaction; (c) Meyer's own data show that low ability attributions resulted in *less* not *more* reward.
Cooper & Burger (1980)	82 pre-service teachers.	Read a questionnaire in which a successful or unsuccessful student was described and were presented with 12 causal attributions for student's performance. For each attribution the teacher stated how strongly (s)he would praise/criticize the student and whether (s)he would work more/less with the student.	Teachers showed a greater intention to criticize failure when it was due to internal, unstable, teacher ineffective causes (i.e., attention, phsiological processes, immediate effort). Failure caused by external events (task, teacher, other students, family) led to the *least* intention to criticize. Greater intention to praise success when caused by teacher influence (i.e., attention, immediate effort, interest, teacher) than by little influence (i.e., psychological processes, family, other students, task).
Covington, Spratt, & Omelich (1980)	304 students enrolled in introductory psychology; half were randomly assigned to the "teacher" condition.	Questionnaire describing eight failure situations in terms of overall effort (high or low), stability of effort expenditure (stable or unstable) and direction of unstable low effort. "Teachers" dispersed feedback to each student.	Low student effort, regardless of stability, led to more negative teacher feedback than did high effort. Low effort pupils were seen by teachers as less conscientious, less motivated, less persistent, more likely to procrastinate and lazier. Indeed, punishment did *not* depend on teacher inferences about student ability but on motivational labeling. (Findings support Meyer, 1979).
King (1980)	1 8th grade teacher and 2 "successful" students and 2 "unsuccessful" students in the class (case study).	Interviews with and observations of students and the teacher.	Student A (success attributed to ability by the teacher) was often called on by the teacher when she wanted to change the pace or direction of lesson. Student B (success attributed to effort) was believed by teacher to "catch on" with merest clues. When student requested help, the teacher expected the problem to be minor and hard "catch on" with merest clues. Student C (lack of success due to lack of ability) was provided additional academic support by teacher helped her understand task requirements and worked thru a problem with her. Teacher frequent interacted with Student C. Student D (lack of success due to lack of effort) was seldom interacted with by the teacher.
Medway (1979)	24 elementary teachers who had each referred a child for special education.	Teachers were asked to rate the importance of each of the following factors in contributing to the student's major problems; ability; effort; adjustment or personality; home situation; educational preparation; teaching. Teachers were observed interacting with the target children.	Teachers' effort attributions were the only attributions that significantly predicted teacher's use of criticism (accounting for 37% of the overall 63% variability in teacher criticism predicted.) Teachers gave more criticism to students whose performance was attributed to low vs. high effort. Teachers' attributions were *not* related to teachers' use of praise.

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Table 10 (continued)

Studies on the Relationship Between Teachers' Attributions and Teacher Behavior

Study	Subjects	Task	Results
Meyer (1979)		Criticism of Cooper and Baron (1977).	Criticized personal responsibility measure used by Cooper and Baron for not looking specifically at ability vs. effort. Attribution studies have shown that outcomes attributed to high effort receive more praise than low effort. Attributions to low ability receive more praise than attributions to high ability. Meyer also presented his own data which showed a significant positive relationship between effort and teacher reward while the relationship between ability and teacher reward varied according to ability-effort correlation.
Silverstein (1978)	98 teachers in grades 1 through 12.	Evaluated 24 fictitious students who varied in situational dimensions, ability, effort, and outcome (within-SS design).	Significant main effect of effort with greater effort being evaluated more positively regardless of ability or outcome.

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indicate teacher behaviors that might be investigated in future studies of the relationship between teachers' attributions and behaviors.

The relationship among teachers' attributions, teachers' planning and interactive decision making, and students' achievement. For the most part, research on teachers' attributions has proceeded separately from research on teacher planning and teachers' interactive thoughts and decisions. Virtually no overlap exists between the names of researchers whose research we described above in the sections on teachers' planning and interactive decision making and the names of researchers who have conducted research on teachers' attributions. Even though teachers' attributions were mentioned early on as an important topic to be considered in research on teachers' thought processes (see, for example, National Institute of Education, 1975a), this research has not been integrated into the ongoing body of research on teachers' thought processes. It is not surprising, therefore, that we found no studies that investigated the relationship between teachers' attributions and teachers' planning or between teachers' attributions and teachers' interactive thoughts and decisions. Presumably, the effect of teachers' attributions on teachers' behavior would be mediated through teachers' thought processes either prior to instruction (e.g., teacher planning) or during instruction (e.g., teachers' interactive thoughts and decision). Thus, the link between teachers' attributions and teachers' preactive and interactive thoughts and decisions remains an important one that needs to be examined.

A similar problem exists with regard to the relationship between teachers' attributions and student achievement. Although researchers on teachers' attributions have assumed implicitly that teachers' attributions for the causes of students' performance have subsequent effects on students' performance and achievement, they have not explicitly studied the relationship between teachers' attributions and student achievement. Similarly, researchers on teaching effectiveness, who have been concerned primarily with effects of teaching on student achievement, have tended not to focus on teachers' attributions although they have considered the potential effects of teachers' expectations on student achievement. (See, for example, Brophy, 1982).

In sum, although teachers' attributions are obviously central to an understanding of the mental life of teachers, research is needed that explicates the relationship between teachers' attributions for the causes of students' performance and teachers' preactive and interactive thoughts and decisions. In addition, research is needed that moves from laboratory settings in which researchers employ questionnaire and simulation methods to study teachers' attributions to real-world classroom settings in which researchers study teachers' attributions as part of the teachers' ongoing thoughts and actions during everyday teaching. In these settings, researchers also need to investigate the relationship between teachers' actual attributions for the causes of students' performance, teachers' thoughts and behavior, and students' classroom performance and achievement. Only then will there be a better understanding of the importance of teachers' beliefs about students, as represented by their attributions for the causes of students' performance.

Teachers' Implicit Theories of Teaching and Learning

Research on teachers' implicit theories constitutes the smallest and youngest part of the literature of research on teacher thinking.

Yet, according to Munby (1982), inquiry into this topic is central to a complete and useful understanding of thought processes in teaching. While researchers may learn much that is interesting and useful from a technical point of view from research on teacher planning, interactive thinking, and teachers' attributions, they can make sense of these findings only in relation to the psychological context in which the teacher plans and decides. For an individual teacher, this psychological context is thought to be composed of a mixture of only partially articulated theories, beliefs, and values about his/her role and about the dynamics of teaching and learning. The purpose of research on teachers' implicit theories is to make explicit and visible the frames of reference through which individual teachers perceive and process information.

Studies of teachers' implicit theories are difficult to summarize briefly. Reports of several of the studies have been published as books or reported in lengthy doctoral dissertations. Thus, our condensation of this research is necessarily selective and incomplete in its details. This section might best be used as an annotated index and guide to this literature rather than as an exhaustive summary and review.

As is the case with much of the teacher thinking literature, the studies of teachers' implicit theories are small-sample descriptive research. The nine studies summarized in Table 11 constitute those that focus on teachers' implicit theories directly. The methods of inquiry included ethnographic participant observation, clinical interviews, stimulated-recall, and the repertory grid technique. The terms used to designate the topic of study included the teacher's personal perspective (Janesick, 1977), conceptual system (Duffy, 1977), principles of

Table 11

Nine Studies of Teachers' Implicit Theories

Study	Method of Inquiry	Teachers	Findings
Bussis, Chittenden, & Amarel (1976)	Clinical Interview	60 elementary teachers implementing open or informal teaching.	Four contrasting orientations identified for each of four aspects of teachers' belief systems: 1) curriculum priorities, 2) role of children's needs and feelings, 3) children's interests and freedom of choice, and 4) importance of social interaction among children.
Conners (1978b)	Stimulated-Recall	9 elementary teachers; one each from first, third and sixth grades in three schools.	1. Three overarching principles of practice: a. Suppressing emotions b. Teacher authenticity c. Self-monitoring 2. Five general pedagogical principles: a. Cognitive linking b. Integration c. Closure d. General involvement e. Equality of treatment
Duffy (1977)	Repertory Grid Technique & Observation	8 teachers of beginning reading.	Four of eight teachers behaved in ways consistent with their espoused belief systems about teaching reading. The teaching behavior of the remaining four teachers departed, to various degrees, from their espoused beliefs.
Elbaz (1981)	Clinical Interview Observation	1 teacher of high school English.	1. Five content areas of teacher practical knowledge. a. Curriculum b. Subject matter c. Instruction d. Milieu e. Self 2. Five orientations of practical knowledge: a. Situational b. Social c. Personal d. Experiential e. Theoretical 3. Three structural forms of practical knowledge: a. Rules of practice b. Practical principles c. Images

Table 11 (continued)

Nine Studies of Teachers' Implicit Theories

Study	Method of Inquiry	Teachers	Findings
Ignatovich, Cusick, & Ray (1979)	Q-sort	47 elementary teachers, 22 elementary principals, & 12 administrators.	1. Teachers and principals had similar belief systems effective teaching that stressed the humanistic, social, and group process aspects of the teacher's role. 2. Administrators implementing "national management systems" defined effective teaching in terms of standardized test results, administrative evaluation, and the influence of outside forces on classrooms.
Janesick (1977)	Participant Observation	1 teacher of sixth grade.	Teacher's perspective centrally concerned with creating and maintaining a stable and cohesive group.
Marland (1977)	Stimulated-Recall	6 elementary school teachers; language arts and math lessons by 2 first grade and 2 third grade teachers; language arts lessons only by 2 sixth grade teachers.	Five principles of practice documented: 1. Compensation 2. Strategic leniency 3. Power sharing 4. Progressive checking 5. Suppressing emotions
Munby (1983)	Repertory Grid Technique	14 teachers of junior high school.	1. Wide individual differences in teachers' role definitions linked to variations in curriculum implementation. 2. The number of constructs needed to describe a teacher's implicit theory ranged from three to six. 3. Five most common constructs in teachers' implicit theories: a. Student learning and developmental goals b. Student involvement c. Teacher control and authority d. Student needs and limitations e. Motivation

Table 11 (continued)

Nine Studies of Teachers' Implicit Theories

Study	Method of Inquiry	Teachers	Findings
Olson (1981)	Repertory Grid Technique & Interviews	8 teachers of science in three British comprehensive secondary schools.	1. High teacher classroom influence and control was the primary construct around which teachers' theories of good teaching were organized. 2. Teachers transformed and distorted new curriculum to fit their implicit theories of teaching.

practice (Marland, 1977), construct system (Bussis, Chittenden, & Amarel, 1976), practical knowledge (Elbaz, 1981), and implicit theories (National Institute of Education, 1975b). Although each of these terms has a somewhat different meaning, they hold in common the idea that a teacher's cognitive and other behaviors are guided by and make sense in relation to a personally held system of beliefs, values, and principles. Prior to the researcher's intervention, these systems are typically not well specified, and the central task of the researcher is to assist the teacher in moving from an implicitly held and private belief system to an explicit description of his or her cognitive frame of reference. Because much of this domain is unexplored territory, a great deal of energy has gone into inventing and discovering appropriate language to describe teachers' implicit theories in ways that remain faithful to the teachers' own felt sense of what they believe.

Some researchers have focused on teachers' implicit theories about a particular part of the curriculum (e.g., Duffy's 1977 work on conceptions of reading). Other researchers have been concerned with teachers' general conceptions of their role (Janesick, 1977; Munby, 1983), with their beliefs about curriculum (Bussis et al., 1976), and with the principles they use to explain their own interactive behavior (Marland, 1977; Conners, 1978b). Elbaz (1981) was more concerned with discovering the structure and content of teachers' practical knowledge than with describing the particulars of the knowledge held and used by one teacher. Ignatovich, Cusick, and Ray (1979) provide a striking picture of the conflicting belief systems about teaching held by teachers and administrators.

Teachers perspectives of their roles as teachers. In a seven-month long ethnographic field study of a sixth-grade teacher and his class, Janesick (1977) attempted to discover and describe the perspective held by that teacher about his role. Taking a symbolic interactionist view, Janesick defined a perspective as a reflective, socially-derived interpretation of experience that serves as a basis for subsequent action. The teacher's perspective combines beliefs, intentions, interpretations, and behavior that interact continually and are modified by social interaction. At any given time, a teacher's perspective serves as the frame of reference within which s/he makes sense of and interprets experience and acts rationally.

Janesick found that the broadest and most dominant aspect of the teacher's perspective was his commitment to creating and maintaining a stable and cohesive classroom group. The teacher made plans and interactive decisions and interpreted classroom events in terms of their impact on the group cohesiveness of the class. He defined the most important aspect of his teaching role as that of group leader. Group consensus and cooperation were his main criteria for a successful classroom activity.

Teachers' conceptions of reading. A study by Duffy (1977) of teachers' conceptions of reading differed from Janesick's work in several ways. Rather than building a picture of one teacher's conceptions inductively, as Janesick did, Duffy began with a typology consisting of five contrasting approaches to the teaching of reading, derived from literature review: basal text, linear skills, natural language, interest, and integrated whole. A sixth conceptual system labeled "confused/frustrated" was added later. The purposes of the

Duffy study were to describe the distribution of these conceptions of the teaching of reading among teachers and, in a second phase of the study, to compare teachers' espoused beliefs with their actual classroom behavior.

Duffy had 350 teachers of beginning reading sort propositional statements about the reading process into five categories ranging from "most like me" to "least like me." Each of the six conceptions of reading listed above was represented by six propositions, giving a total of 36 propositional statements to be sorted. Only 37 of the 350 teachers were found to manifest strong "pure types" of conceptions of reading. This finding suggests that perhaps the conceptions teachers hold about the teaching of reading do not fit neatly into the research-based typology and that they may be more complex and eclectic than those of reading researchers.

In the second phase of the Duffy study, the 37 teachers who manifested strong unitary conceptions of reading completed a modified version of the Kelly Role Repertory Test to refine further and specify more clearly their beliefs about reading. Eight teachers from this group who continued to manifest clear and categorical conceptions of reading were each observed teaching reading in their own classrooms on 10 occasions. The extent to which these teachers' instructional behavior reflected their expressed conceptions of reading was determined by analysis of ethnographic field notes and post-observation interview data. Duffy reported that,

> Four teachers consistently employed practices which directly reflected their beliefs; these included two teachers who had structured beliefs (basal/linear skills), a teacher who had an eclectic view, and one of the teachers having an unstructured belief system (natural language/interest/integrated whole). Of

> those whose practices did not reflect their beliefs, two of the teachers having strong unstructured belief systems were found to be smuggling elements of unstructured practices into an administratively-imposed program reflecting a structured view. Two other teachers holding unstructured views, however, did not consistently reflect their beliefs; one of the teachers employed practices which, to a large degree, were counter to the unstructured belief system she espoused, while a second teacher operationalized unstructured beliefs only some of the time with some pupils and some activities. (Duffy 1977, pp. 7-8).

The Duffy study of conceptions of reading portrays a flexible and complex relationship between teachers' implicit theories and their classroom behavior. The results suggest that constraints on teacher behavior such as mandated curriculum materials, resources, time available, habits, and student abilities may interpose between theory and action and account for observed discrepancies. Because the study design began with researcher-selected categories of conceptions of reading that described only about 10% of the teachers surveyed, the results speak as much to what teachers' conceptions of reading are not as to what they are.

Teachers' implicit theories and beliefs in open education settings. Bussis, Chittenden, and Amarel (1976) described teachers' understandings of curriculum, learners, and their working environments through use of extensive clinical interviews of 60 elementary school teachers who were attempting to implement open or informal instruction. Transcripts of the interviews were coded using a coding system devised by the researchers. The Bussis et al. description of the teachers' "curriculum construct systems" revealed a tension between the press to emphasize grade level facts and skills and the need to work toward broader developmental and process goals for learners. The researchers identified four orientations among these teachers ranging from heavy and exclusive emphasis on grade level facts and skills to primary emphasis on broader developmental goals. The teachers' orientations concerning students' emotional needs and feelings ranged from the position that the needs and feelings of students were relatively unimportant or irrelevant as a teaching priority (20% of the teachers) to the belief that the expression of needs and feelings was integral to and inseparable from the learning process (33%). Similarly wide variance was found in teachers' beliefs about the importance of students' interests, freedom of choice in what and how they learn, and about the role of social interaction among children as a means to learning. (See Clark & Yinger, 1977, for a more extensive account of the results of the study.)

Bussis et al. moved beyond the a priori category system approach of Duffy to a coding approach derived from teachers' responses to clinical interviews. The results highlight the wide variations in teachers' belief systems even within a sample of teachers who shared a commitment to open education and informal learning.

Principles of practice. Two doctoral dissertations completed at the University of Alberta (Marland, 1977; Conners, 1978b), while primarily concerned with the thoughts of teachers during the interactive teaching process, also revealed much of interest about the principles that guide and explain teacher behavior. One of Marland's analyses of stimulated-recall interview transcripts permitted him to derive five principles of practice that were mentioned independently by at least two of the six teachers studied or that played a powerful role in influencing the interactive behavior of one teacher. These principles of practice, can be described as follows:

The principle of compensation represented an attempt on the teacher's part to discriminate in favor of the shy, the introverted, the low-ability group, and the culturally impoverished. Two of the four teachers who applied this principle were first-grade teachers. This principle figured less prominently in the explanations of teachers of higher grades.

The principle of strategic leniency was a variation of the principle of compensation. Strategic leniency referred to a teacher's tendency to ignore infractions of classroom rules by children who the teacher regarded as needing special attention.

The principle of power sharing involved the teacher using the informal peer power structure to influence students. In this way, the teacher was seen as sharing both responsibility and authority with certain students. That is, the teacher would selectively reinforce the good behavior of students whom she perceived as class leaders to use their influence on their peers as an instrument for classroom management.

The principle of progressive checking involved periodically checking progress, identifying problems, and providing encouragement for low-ability-group students during seat work. In addition to the direct assistance provided during this checking, the teacher who used this principle also reasoned that she was providing stimulus variation for students with short attention spans.

The principle of suppressing emotions was derived from the reports of teachers who said that they consciously suppressed the emotional feelings they were experiencing while teaching. This principle was invoked because of the belief that if they expressed their feelings and emotions, it might overly excite the students and encourage them to express their own feelings and emotions, thus creating a management problem.

The five principles of practice identified by Marland seem to deal primarily with student characteristics. Compensation, strategic leniency, and power sharing all require that the teacher know his/her students well enough to judge which ones would benefit from the kinds of selective responses indicated by each principle. Suppressing emotions is a preventative strategy involving teacher self-management for the sake of orderly classroom management. By implication, teachers who use this principle believe that their students are emotionally volatile and that expression of emotions by students is inappropriate and constitutes a breakdown of classroom management. Progressive checking is, in part, a straightforward strategy for dealing with the task demands of seatwork. But the teachers also explained their instructional management behavior in terms of its appropriateness as a treatment for children with short attention spans. In Marland's analysis, conceptions of knowledge or conceptions of a particular subject matter are conspicuously absent among principles guiding interactive teacher behavior.

Conners (1978b) replicated and extended Marland's results with nine elementary teachers. His analysis of stimulated-recall protocols revealed that all nine teachers used three overarching principles of practice to guide and explain their interactive teaching behavior: suppressing emotions, teacher authenticity, and self-monitoring.

The principle of suppressing emotions was similar to that described by Marland. But in addition to its use as a disruption-prevention strategy, Conners' teachers reported using what could be called "visible suppression of emotions" (e.g., remaining silent and stern-faced until the class quiets down) and intentionally violating this principle by occasionally expressing anger or frustration to make a powerful impression on their students. This last example suggests that principles of practice can be used flexibly by teachers and even appropriately contravened in certain circumstances.

The principle of teacher authenticity involved teacher presentation of self in such a way that good personal relationships with students and a socially constructive classroom atmosphere would result. This principle was expressed as a desire to behave in ways that were open, sincere, honest, and fallible.

The principle of self-monitoring was defined as the need for teachers to remain aware of their behavior and the estimated effects of it on their students. For the teachers interviewed by Connors, this principle seemed to be acted upon at a global and intuitive level of judgment, for example, by asking oneself "How am I doing?" regularly during teaching.

Connors also identified five general pedogogical principles held by teachers: cognitive linking, integration, closure, general involvement, and equality of treatment. The first three of these principles dealt with how information to be learned should be organized and presented.

The principle of cognitive linking dictated that new information should be explicitly related by the teacher to past and future student learning experiences. The principal of integration called for opportunities for students to practice and apply skills and concepts learned in one subject area in other subjects and contexts in pursuit of transfer of training. The principle of closure involved teacher commitment to the importance of summarizing, reviewing, and tying together main points at the end of a lesson or unit. Taken together, these three principles imply a view of the student as an active learner who stores and retrieves information on the basis of meaningful connections among facts and concepts and for whom transfer and integration require explicit practice.

The final two principles claimed by Connors' teachers dealt with their commitments regarding the social dynamics and ideology of the classroom. The principle of general involvement was expressed as the desire to have all students participate fully in class activities, to minimize student isolation (self-selected or otherwise), and to help shy or withdrawn students to overcome their reluctance to participate. The principle of equality of treatment called for fair and consistent treatment of each student. It is possible to imagine classroom situations in which these last two principles would conflict, for example, violating the principle of equality of treatment to provide special attention, encouragement, or reward to a withdrawn student for his/her full participation in a learning activity. This hypothetical example suggests that principles of practice, while useful as general guides for planning, organizing, and teaching in the classroom, are not sufficient by themselves and require artful interpretation, balance, compromise, and, occasionally, intentional violation to serve the experienced teacher well.

Elbaz (1981) examined the practical knowledge of one high school English teacher who was developing a course on learning skills at the time of the study. Elbaz reports the particulars of this teacher's practical knowledge in great detail in her doctoral dissertation (Elbaz, 1980; 1983). For the purposes of this review, the most relevant findings concern the nature of teacher's practical knowledge, as summarized in Table 11. The five content areas of teacher practical knowledge (curriculum, subject matter, instruction, milieu, and self) are largely self-explanatory and not at all surprising. The five orientations of practical knowledge claimed by Elbaz (situational, social, personal, experiential, and theoretical), taken together, suggest that a teacher's practical knowledge is not acquired vicariously and abstractly (as in a teacher preparation course) but is learned, tested, and developed through field experience.

The three structural forms that Elbaz uses to describe the teacher's practical knowledge (rules of practice, practical principles, and images) provide a particularly useful framework for thinking about the research on teachers' implicit theories and about the dynamics of those theories in use. According to Elbaz, rules of practice are brief, clearly formulated statements prescribing how to behave in frequently encountered teaching situations. Implementation of a rule of practice is a simple matter of recognizing a situation and remembering the rule. In contrast, a principle of practice is a more general construct than a rule of practice, derived from personal experience, and embodying purpose in a deliberate and reflective way, which can be drawn upon to guide a teacher's actions and explain the reasons for those actions. The use of a principle of practice depends largely on teacher reflection. Thirdly, images are personally held mental pictures of how good teaching should look and feel, expressed by the teacher in terms of brief metaphoric statements or analogies. According to Elbaz, teachers work intuitively rather than analytically to realize their images of good teaching.

Comparisons of teachers' implicit theories with those of curriculum developers. Two related studies of teachers' implicit theories took as their starting point the problem of implementation of new curricula. Both studies employed a version of the repertory grid technique to elicit labels for constructs that the teachers used in thinking about, evaluating, and classifying teacher and student behavior. In both studies, each teacher's own words were used, in large measure, to describe his/her implicit theory of teaching. In the first study, Olson (1980; 1981) presented a list of 20 teaching events, selected to reflect a wide range of science teaching methods, to eight science teachers who were implementing a new curriculum in British secondary schools. Each teacher was asked to sort and group the 20 statements, to discuss the basis for grouping with the investigator, and then to coin a label for each group. These labels were termed "constructs" by Olson. Finally, the teacher-generated construct labels (plus five construct labels supplied Olson) were arrayed along the horizontal axis of a grid, with the 20 statements about teaching and learning arrayed along the vertical axis. Each teacher then noted the degree of relationship between each construct and each teaching/learning statement. The results of this rating process were used to describe relationships among constructs through correlational analysis and among statements about teaching and learning through factor analysis.

Olson determined that, for these teachers, the most important underlying construct in their implicit theories of teaching was classroom influence. The new science curriculum being implemented at the time of the study called for reduced teacher influence in the classroom "as a consequence of project features such as: free ranging discussion episodes; downplaying in the design the importance of content in science teaching and examination preparation; requiring teachers to instruct outside their discipline" (Olson, 1981, p. 265). According to Olson's analysis, the teachers dealt with the tension between their belief that teacher influence should be high and the curriculum developers' belief that teacher influence should be low by "domesticating" the curriculum project so that it became compatible with their implicit theories of good teaching:

> For example: discussions became lectures or recitations; intellectual skills development was translated as content memorization and examination rehearsal; the integrated design was translated as a patchwork of specialized content to be unravelled and resewn; criterion referenced assessment was translated as norm based. In short, after a period of experimentation during which they saw their influence declining, the teachers re-established influence through varied domestications of the project doctrine (Olson, 1981, p. 265).

In a related study of the implicit theories of teaching of 14 junior high school teachers, Munby (1983) used the repertory grid technique in two sessions, separated by three days. In the first session, the investigator asked each teacher to generate a set of brief statements describing what one might see during a visit to one of the teacher's classes. After generating about 20 descriptive statements (called "elements" by Munby), each teacher was asked to group the cards on which the statements were written into as many groups as made sense to the teacher. Next, each teacher was asked to discuss the bases for his/her groupings and the distinctions and other relationships between groups of statements. The investigator recorded the terms and phrases used by each teacher to explain and rationalize the groupings, and these became the "contructs" constituting the teacher's implicit theory. Finally, the "elements" and "constructs" were listed along the two axes of a grid, and the teacher was asked to consider each element in turn and rate the strength of its association with each construct.

Between the first and second interviews, Munby factor analyzed the grid to produce construct groupings. The purpose of the second interview was to discover what beliefs and principles underlie the resultant factors. This interview and analysis process produced labels for each of the factors and teacher explanations of the relationships between the factors. From the transcripts of these second interviews, Munby identified a set of teacher statements that constituted the principles and beliefs that he characterizes as "phrases, statements, or terms which convey significant meaning to the teachers and to us about their professional activity" (Munby, 1983, p.27).

Munby makes a forceful case that the most appropriate mode for reporting findings from his research is the case study. His report offers excerpts from 14 case studies that illustrate the wide individual differences in the implicit theories of teachers working at the same school and even within the same subject matter specializations. The existence of these idiosyncratic variations in beliefs and principles is used by Munby to explain how and why a nominally common curriculum is inevitably interpreted and implemented differently by each teacher teaching from it. In describing the general nature of teachers' implicit theories as derived from this study, Munby found that each teacher enunciated between three and six principles. The five most frequently mentioned construct categories were: (a) student learning and developmental goals, (b) student involvement, (c) teacher control and authority, (d) student needs and limitations and, (e) motivation.

The Olson and Munby studies provide a sense of both the variability and consequentiality of teachers' implicit theories about teaching. Both researchers make a persuasive case for staying close to the language of practice in eliciting and describing teachers' belief systems, a position also supported by Elliott (1976). When implementing a significant curricular, organizational, or instructional change, these researchers argue that teachers' belief systems can be ignored only at the innovator's peril. These findings are supported by the results of a Q-sort study by Ignatovich, Cusick, and Ray (1979), in which the belief systems of elementary teachers, elementary principals, and of those administrators attempting to influence classroom procedures by implementing rational management models were contrasted. They found that both teachers and elementary principals' belief systems emphasized positive relations between teachers and students, a constructive classroom social system, and humanistic approaches to instruction. In contrast, "rational management system" administrators defined effective instruction in terms of student achievement on standardized tests, abstract models of classroom learning, administrative evaluation, and the influence of outside forces on classrooms.

Summary. It is difficult to synthesize a clear and unequivocal set of conclusions about teachers' implicit theories from this small and eclectic collection of studies. At the very least, we can say that teachers do seem to hold implicit theories about their work and that these conceptual systems can be made more explicit through a variety of direct and indirect inquiry techniques. Even within what appear to be relatively homogeneous groups of teachers (e.g., teachers implementing open education approaches) there is wide variation in the content and orientation of teachers' implicit theories. The several studies that describe teachers' principles of practice suggest that relatively few such principles (3 to 6) are needed to describe a teacher's implicit theory of teaching.

The principles of practice that teachers draw upon to explain their interactive teaching behavior deal (directly or indirectly) with student characteristics and states, teacher states, and, to a lesser extent, with the structure and organization of subject matter. Duffy's (1977) study of conceptions of reading suggests that the correspondence between teachers' espoused beliefs and classroom behavior is not always high and is moderated by circumstances that are beyond the teacher's control. This study also signalled a gradual move away from the language of researchers and toward the language of teachers in describing teachers' implicit theories.

The Ignatovich et al. (1979), Olson (1981), and Munby (1983) studies raise the possibility that conflict between teachers' implicit theories about good teaching and those of administrators or curriculum developers may explain historic and continuing difficulties in implementation of educational innovations. Elbaz's (1981) analysis of teachers' practical knowledge, especially concerning the three structural forms of practical knowledge, holds promise as an organizing conceptual system for future research and modeling of teachers' implicit theories and belief systems in use.

Conclusions

The Second Handbook of Research on Teaching (Travers, 1973) did not include a chapter or even a reference to research on teachers' thought processes. The research reviewed in this chapter and the view of teaching and inquiry that guide this research are new. Many of these studies raise as many questions as they answer, about method as well as about teachers' thought processes. These limitations notwithstanding, however, our review suggests a number of broad conclusions about research on teachers' thought processes.

First, the research shows that thinking plays an important part in teaching, and that the image of a teacher as a reflective professional, proposed originally by NIE Panel 6 on Teaching as Clinical Information Processing (National Institute of Education, 1975a), is not far-fetched. Teachers do plan in a rich variety of ways, and these plans have real consequences in the classroom. Teachers make decisions frequently (one every two minutes) during interactive teaching. Teachers do have theories and belief systems that influence their perceptions, plans, and actions. This literature offers us an enriched picture of what teaching is by adding rich descriptions of the mental activities of teachers to the existing body of work that describes the visible behavior of teachers.

Because this research is so new, each study seems to break new ground. At this time, there is little that could be called a systematic and cumulative body of research. Most of the research on teachers' thought processes has been done with elementary school teachers, and there is a conspicuous absence of attention to the thought processes of secondary school teachers. Researchers have also tended to focus on relatively discrete and isolated aspects of teachers' thoughts and actions, rather than on the whole process of teaching or on the relationships between, for example, teacher planning and interactive thoughts and action in the classroom. While a narrow focus may be useful early in a research enterprise, the time seems right for more comprehensive study of the full variety of teachers' thought processes in relation to teachers' actions and their effects on students. Similarly, a vast majority of teachers participating in this research have been experienced teachers. The literature provides little sense of how teacher planning, interactive thinking and decision making, and implicit theories and beliefs develop over time, and, therefore, what kinds of interventions might help these processes along. Longitudinal studies of the development of teachers' thought processes would be one answer to this need.

The many different contexts in which these studies of teacher thinking have been done highlights the variety of task demands encountered in teaching. Teachers' thought processes seem to constitute more or less adaptive array of responses to perceived task demands of the profession. This literature provides a reasonably good start at describing teachers' cognitive behavior, but has not done an adequate job of describing the tasks and teaching situations that call for thoughtful teaching. Researchers would do well to work simultaneously on descriptive models of teacher thought processes and on descriptive models of the tasks of teaching.

While research on teachers' thought processes is new, it has deep roots in early teaching effectiveness and curriculum research. Studies of teacher thinking are potential sources of hypotheses about and explanation of some of the puzzling and contradictory findings of process-product research on teaching and of curriculum change implementation research. For example, if the teacher's implicit theory about learners or his/her mental image of effective teaching were contrary to that embodied in a new curriculum or an experimental teaching method, s/he would be unlikely to bring the innovation alive with great enthusiasm, thoroughness, and persistence. Alternatively, if an innovation or experimental treatment were introduced after a teacher's yearly and term planning were complete, it would be unlikely that the innovation would be integrated into the classroom activity flow as thoroughly as the researcher would hope. Teacher thinking, as represented in this literature, can be thought of as a set of moderating contextual factors that could influence substantially the outcomes of teacher effectiveness and curriculum effectiveness studies.

While no single study has documented every aspect of the thought processes of a teacher, from this literature we can elaborate on the picture of the teacher as a reflective and thoughtful professional that was originally sketched out by NIE Panel 6 (National Institute of Education, 1975a).

The emerging picture of the teacher as a reflective professional is a developmental one that begins during undergraduate teacher education (or even earlier) and continues to grow and change with professional experience. The teacher education majors who would become professionals in this sense are firmly grounded in the disciplines and subject matters that they will teach. Their study of subject matter focuses on both content and on the cognitive organization of that content in ways useful to themselves and to their future students. They have had both supervised practice in using the behavioral skills and strategies of teaching and have also been initiated into the less visible aspects of teaching including the full variety of types of planning and interactive decision making.

The maturing professional teacher is one who has taken some steps toward making explicit his/her implicit theories and beliefs about learners, curriculum, subject matter, and the teacher's role. This teacher has developed a style of planning for instruction that includes several interrelated types of planning and that has become more streamlined and automatic with experience. Much of his/her interactive teaching consists of routines familiar to the students, thus decreasing the collective information processing load. During teaching, the teacher attends to and intently processes academic and non-academic sociocognitive events and cues.

Experienced teachers have developed the confidence to depart from a planned course of action when they judge that to be appropriate. They reflect on and analyze the apparent effects of their own teaching and apply the results of these reflections to their future plans and actions. In short, they have become researchers of their own teaching effectiveness.

A decade of research on teachers' thought processes has taught as much about how to think about teaching as it has about teachers' thinking. Most educators would probably have agreed with the authors of the NIE Panel 6 report that teaching is a complex and cognitively demanding human process (National Institute of Education, 1975a). The research reviewed here has begun to describe in detail the many ways in which teaching is complex, demanding, and uniquely human.

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